



# Elevating West Virginia: a Vision for Advanced Air Mobility

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## Glossary of Acronyms and Abbreviations

AAM	Advanced Air Mobility
ACI	Advanced Composite Institute
AHP	Analytical Hierarchy Process
AIP	Airport Improvement Program
ARC	Appalachian Regional Commission
ASSURE	Alliance for System Safety of UAS through Research Excellence
BEAD	Broadband Equity Access and Deployment
BKW	Raleigh County Memorial Airport
CKB	North Central West Virginia Airport
CRW	West Virginia International Yeager Airport
C2	Command and Control
DAA	Detect and Avoid
DARPA	Defense Advanced Research Projects Agency
DOT	Department of Transportation
EAS	Essential Air Service
EBD	Southern West Virginia Regional Airport
EMS	Emergency Medical Services
FAA	Federal Aviation Administration
GDP	Gross Domestic Product
I28	Innovate28
LAM	Low-Altitude Mobility
MAAC	Mid-Atlantic Aerospace Complex
MOF	Mobile Operations Facility
NASA	National Aeronautics and Space Administration
NPIAS	National Plan of Integrated Airport Systems
NRQZ	National Radio Quiet Zone
NTIA	National Telecommunications and Information Administration
RAM	Regional Air Mobility
RCC	Remote Control Center
SIRN	Statewide Interoperable Radio Network
STEM	Science, Technology, Engineering and Math
SWVCTC	Southern West Virginia Community and Technical College
UAM	Urban Air Mobility
UAS	Uncrewed Aircraft Systems
VTOL	Vertical Takeoff and Landing
WV	West Virginia
WVU	West Virginia University
WV-AEIM	West Virginia Advanced Energy and Industrial Technology Manufacturing

## Executive Summary

Advanced Air Mobility (AAM) is a step-change in aviation that is revolutionizing the transportation of people, goods, and services throughout the United States and transforming the economy. In the U.S. alone, the AAM market is estimated to reach \$115 billion annually by 2035, employing more than 280,000 high-paying jobs.<sup>1</sup>

In 2023, the FAA released their Innovate28 (I28) plan, targeting AAM integration in key locations by 2028. This plan represents a call to action for states by highlighting the importance of state and tribal government leadership in enabling AAM operations.<sup>2</sup> Several states are responding to this call and recognizing the benefits AAM can provide to their communities and economies. States that enable safe, sustainable, scalable AAM deployments can become early adopters and beneficiaries of this revolutionary technology. With many state and industry efforts focusing on AAM for complex urban environments, West Virginia has the chance to pioneer rural AAM integration.

West Virginia's strategic location, situated within a 500-mile radius of 40% of the U.S. population, positions it as a promising hub for regional connectivity. The state's challenging topography and rugged landscape have historically created obstacles for traditional transportation systems, providing a demand for innovative solutions. With remote areas, diverse demographics, and varied weather

conditions, West Virginia offers a range of testing environments for AAM aircraft as they mature through type certification.

West Virginia also has unique assets and accelerators that could provide a foundation for AAM, spanning a diverse aerospace and innovation ecosystem, unique funding mechanism and incentives, conducive policies, and supporting infrastructure. Strategically leveraging and building upon these assets and accelerators would offer a once in a generation opportunity to strengthen the state's technology and innovation capabilities.

Enabling AAM in West Virginia would unlock several economic and societal benefits, assuming technology maturation and integration will be realized. Establishing an AAM industry could create almost 5,500 jobs and generate an additional \$29 million in annual state tax revenue. Additionally, AAM could reduce costs for operators by \$40 million annually, including public operators spanning state and local government applications. AAM would present high-paying job opportunities, encouraging upskilling of the current workforce and attracting new residents to the state. Lastly, AAM would improve the quality of life for West Virginians by providing a safe, affordable, accessible, and equitable form of transportation for people and cargo, connecting historically isolated or underserved communities with essential goods and services.



### Economic Benefits of AAM in WV

#### Create Jobs

**5,417 NEW JOBS** created in West Virginia by enabling high-priority AAM applications.

#### Increase Tax Revenue

Over **\$29 MILLION IN ANNUAL STATE TAX REVENUE** generated by AAM-related jobs, business revenue, and property.

#### Reduce Costs for Operators

Over **\$40 MILLION IN ANNUAL COST SAVINGS** for operators, including operational savings and hazard savings by leveraging AAM.



### Societal Benefits of AAM in WV

#### Upskill, Retain and Grow Workforce

AAM creates a wealth of **SPECIALIZED, HIGH-PAYING JOBS**, offering an avenue for **UPSKILLING CURRENT WORKFORCE & DRAWING NEW RESIDENTS** to the state.











#### Improve Access to Transportation, Goods, & Services





AAM enhances **QUALITY OF LIFE FOR RURAL RESIDENTS** by bridging gaps in access to transportation options & delivery of vital goods & services.

To unlock the full spectrum of benefits that AAM can offer the state, West Virginia needs a state government-led approach to strategically capitalize on and enhance its existing assets, fostering the development and maturation of the AAM industry within its borders. As such, Vertx retained Deloitte to develop this report to introduce AAM capabilities, highlight and benchmark West Virginia’s current assets and accelerators, identify high-priority AAM application for the state, and outline potential next steps for West Virginia (below).

While the AAM industry is still emerging, West Virginia should take next steps and act swiftly to build momentum toward the early development and adoption of AAM. A failure to act quickly and decisively may result in a lost opportunity as other states make significant investments in AAM development and infrastructure.

## NEXT STEPS FOR WEST VIRGINIA

-  Engage with Stakeholder Groups Aligned with High-Priority AAM Applications
-  Expand the West Virginia UAS Advisory Council to Include Working Groups
-  Establish an AAM Focal Point within State Government
-  Scale Mingo County K-16 AAM Curriculum across the State
-  Integrate AAM Applications into Government Operations with Standardized Training
-  Coordinate with Regional Players in Neighboring States
-  Designate State Funding for AAM
-  Maintain Harmonization of State AAM Legislation with National Frameworks
-  Leverage Mobile AAM Infrastructure while Developing Permanent Infrastructure
-  Establish Facilities for AAM Training and Testing

-  Ecosystem
-  Funding
-  Policy
-  Infrastructure

# Introduction

## Advanced Air Mobility: the next inflection point in transportation is here

Advanced Air Mobility (AAM) is a rapidly evolving field, encompassing a range of technologies that offer the potential for safe, sustainable, affordable, and accessible aviation transportation.

NASA's vision for AAM is to use emerging aircraft and technology to safely develop an air transportation system that reaches places throughout the United States that were previously not served or underserved by aviation.<sup>3</sup>

These enabling technologies include novel airframe designs, innovative propulsion systems (e.g. electric aircraft), increased levels of automation and connectivity (e.g. uncrewed or autonomous aircraft), and the supporting infrastructure needed to integrate AAM into a broader multimodal transportation network. Experts expect AAM to apply to three main application categories: Regional Air Mobility (RAM), Urban Air Mobility (UAM), and Low Altitude Mobility (LAM).

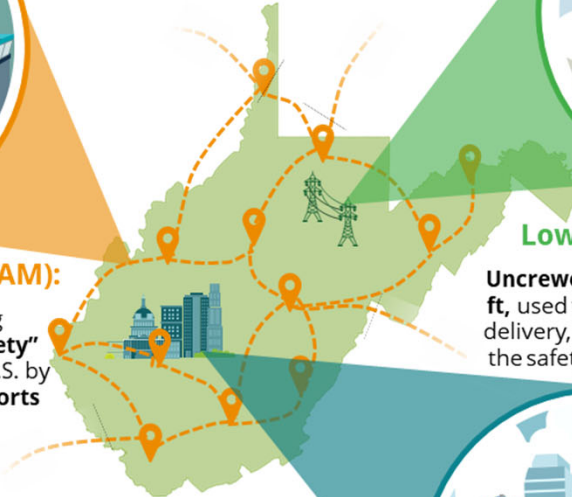
**Exhibit 1: Advanced Air Mobility Defined by Three Application Categories**



**Regional Air Mobility (RAM):**  
New technologies that bring "convenience, speed, and safety" to interregional travel in the U.S. by leveraging underutilized airports



**Low Altitude Mobility (LAM):**  
Uncrewed aircraft that generally fly below 400 ft, used to improve speed & logistics of ground delivery, access to rural & underserved areas, & the safety of inspection & monitoring services



**Urban Air Mobility (UAM):**  
Highly automated aircraft that provide commercial services to the public within intraregional environments; primarily novel eVTOL aircraft which leverage existing heliports or new vertiports

**Benefits:**

- Societal**  
AAM offers an enhanced quality of life by providing the public affordable, safe, efficient and accessible transportation of people, goods, and services
- Economic**  
The AAM market is rapidly growing, creating jobs that stimulate the economy and generate tax revenue
- Environmental:**  
AAM offers alternative forms of transportation with innovative airframes and propulsion systems designed to reduce noise and emissions

**Regional Air Mobility (RAM)** - the concept of directly transporting people and goods between regions - has been around for decades but is on the verge of a resurgence with a heightened demand and new possibilities offered by new technologies. RAM is envisioned to provide convenient, fast, and safe interregional transportation by leveraging underutilized aviation assets, including airports, to address the needs of underserved communities.



**Low-Altitude Mobility (LAM)** - is an aviation application category that has gained momentum in recent years. In general, LAM refers to uncrewed aircraft systems (UAS) that operate at altitudes below 400 feet. These UAS are instrumental in expediting ground delivery logistics, asset monitoring and inspection, and providing vital links to rural and traditionally underserved communities. Furthermore, LAM plays an increasingly pivotal role in public safety, where first responders can utilize these systems for swift aerial assessments during emergencies and rescue operations.



**Urban Air Mobility (UAM)** - is an application category that aims to provide commercial intra-regional flights to the public using highly automated aircraft. UAM aims to leverage advanced technologies and new operational procedures to enable practical, cost-effective air travel as an integral mode of local transportation.



Within these three application categories, numerous applications exist that could enhance the quality of life for communities. AAM has the potential to enable greater mobility and access through alternative transportation options to travel to new connection points. Studies also suggest AAM will connect rural hubs and provide delivery options for greater equitability and accessibility. Additionally, AAM could reduce aviation's operational impact on the environment making it more sustainable through innovative propulsion systems (e.g. electric or hydrogen) and airframe designs that may reduce emissions and noise during operation.<sup>4</sup>

## A booming market: the U.S. AAM market is poised to grow to approximately \$115 billion annually by 2035

The breadth of AAM applications and enabling technologies offers new and extended business opportunities for industry players spanning the infrastructure, manufacturing, supply chain, fleet management, and software spaces. In addition to the commercial utility these technologies provide, many aspects of AAM offer dual use with military applications, driving the demand for AAM even further.

Several industry players are harnessing these opportunities and showing that AAM is no longer a far off, futuristic concept, but rather is a very real step-change in transportation happening today.

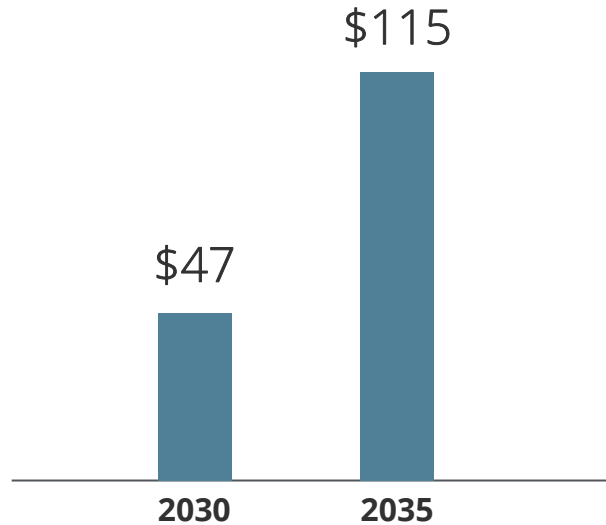
Public-private partnerships across the country are actively designating, planning, or constructing RAM and UAM vertiports for vertical take-off and landing (VTOL) AAM aircraft, as seen in Los Angeles, California,<sup>5</sup> Arlington, Texas,<sup>6</sup> and Orlando, Florida,<sup>7</sup> to name a few. Several energy and utility companies are already performing LAM operations, such as ExxonMobil<sup>8</sup> and Dominion Energy,<sup>9</sup> using UAS to inspect and monitor their infrastructure.

With such a breadth of technologies and applications being developed and used, the AAM market is expansive and rapidly growing.

In the U.S., the national market is projected to grow sevenfold by 2035, reaching \$115 billion annually and generating \$8 billion in tax revenue by employing more than 280,000 high-paying jobs.

The tax revenue from AAM related jobs will only continue to increase over time for state and local governments that enable the industry.<sup>1</sup>

**Exhibit 2: Projected U.S. AAM Market (in billions of USD)<sup>1</sup>**



## A Call to Action: the FAA’s ‘Innovate28’ Plan for AAM integration by 2028

2023 was a banner year for AAM with the FAA’s release of their Innovate28 (I28) plan, which aims to enable AAM operations at scale at one or more “key sites” by 2028. The FAA plans to identify these key sites based on locations and AAM applications of interest to AAM industry stakeholders while promoting an all-hands-on deck approach to guarantee the necessary steps are taken to enable these operations. The I28 plan outlines a “crawl-walk-run” approach which will leverage existing infrastructure,

regulations, and procedures to support earlier entry into service.

Innovate28 highlights the importance of local, state and tribal government leadership in the coordination, logistics, zoning, licensing of infrastructure, and the community engagement necessary to support AAM operations.<sup>2</sup>






# Navigating the new horizon: state government roles in advancing AAM

This nascent new era of aviation, poised to redefine mobility across urban and rural landscapes alike, is drawing significant attention and action from various state and tribal entities aiming to get ahead of this rapidly advancing field (Exhibit 3).

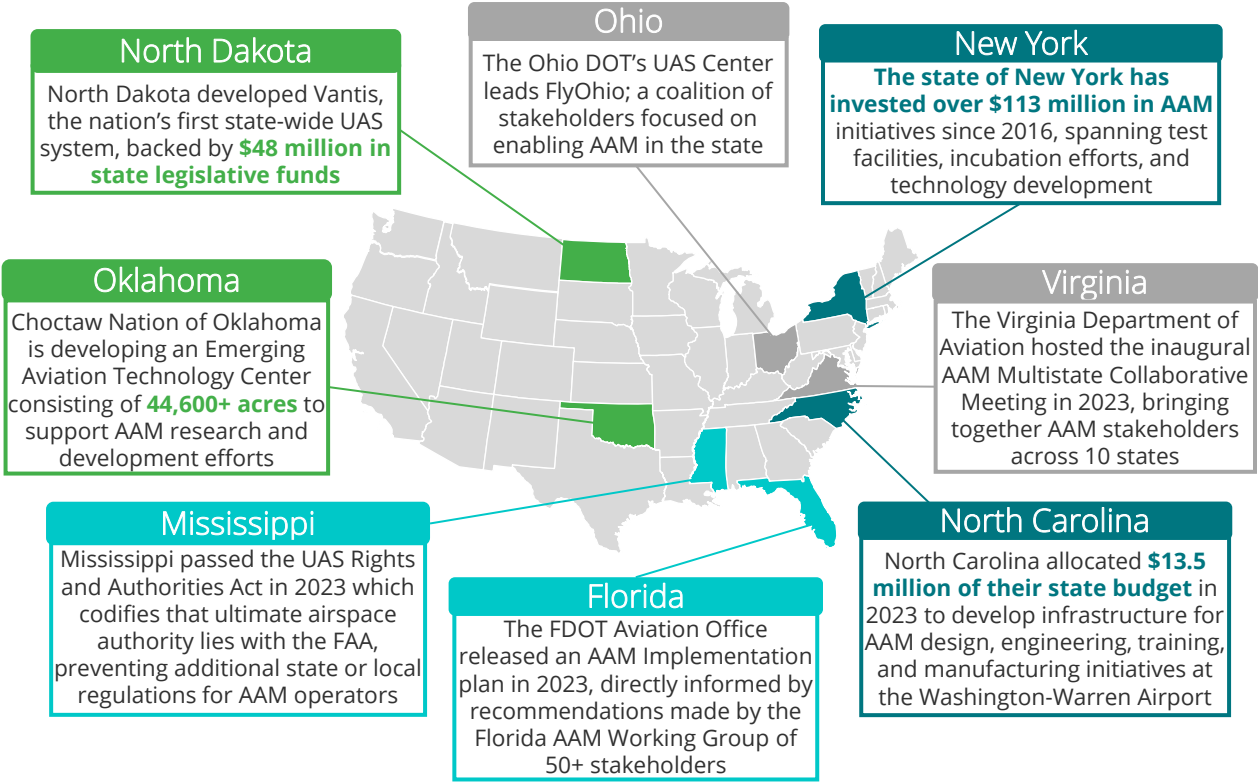
Attracting and maturing the AAM industry will occur faster in regions with strong assets and accelerators across these four pillars, offering industry support and incentives, conducive policies, lower barriers of entry, and supporting infrastructure.

Four common and interdependent themes emerged as key pillars when considering state and tribal roles in AAM efforts:

One such state that holds potential to become a driver and early adopter of AAM is West Virginia. If the state acts strategically, West Virginia has an opportunity to shape their role as a contributor to the national AAM plan and tap into the projected \$115 billion market.

-  **Ecosystem:** Active state support of and engagement with the AAM ecosystem
-  **Funding:** Diverse funding channels and mechanisms to support AAM
-  **Policy:** Proactive policies that are conducive to AAM testing and operations
-  **Infrastructure:** Development and maintenance of essential infrastructure to support AAM testing and operations

**Exhibit 3: Examples of State and Tribal AAM Efforts**



## West Virginia: potential to be the next proving ground for AAM

West Virginia’s location, rugged landscape, and local demand for accessible, multimodal transportation provide many opportunities for early AAM research and operations.

West Virginia is strategically located between numerous major metropolitan centers<sup>10</sup> including Washington, D.C.; Pittsburgh, Pennsylvania; Lexington, Kentucky; and Columbus, Ohio. Bordering five states, West Virginia lies within a 500-mile radius of 40% of the U.S. population<sup>11</sup> and is home to 23 airports included in the FAA’s National Plan of Integrated Airport Systems (NPIAS). This positioning is particularly significant considering the current range limitations of many RAM aircraft, which is typically less than 300 nautical miles.<sup>12</sup>

West Virginia could serve as an essential connection point in the AAM network, effectively bridging the Midwest to the East coast.

The state’s topography - characterized by steep mountains, narrow valleys, and winding roads - has historically hindered the development of efficient and cost-effective traditional transportation systems in West Virginia, prompting a need for innovative solutions to address these challenges. Over 81% of West Virginia’s population lives in rugged terrain (measured by road topographical variations), which is the highest proportion in the United States,<sup>13</sup> and more than 24% of West Virginia’s rural residents lack access to intercity transportation including air, rail, and bus services.<sup>14</sup>

The state’s extensive road system, overseen by the West Virginia DOT, comprises of 34,420 miles of roads and highways, representing the sixth-largest state-maintained system in the nation.<sup>15</sup> Annually, West Virginia’s road system costs the state about three times more than the revenue it generates.<sup>16</sup> In comparison, West Virginia’s aviation system only costs the state about two times more than the revenue it generates, showing a promising return on investment.

### Exhibit 4: West Virginia’s AAM Potential



#### Positioned to be a Regional Hub

Situated within 500-mile flight radius of 40% of the U.S. population, bridging several metropolitan centers in the Midwest and East Coast.

#### Demand & Opportunity for Innovative Transportation

More of the population lives in rugged terrain than any other state, as measured by topographical variations in roadways, posing challenges to road development and maintenance as well as overall access to ground-based transportation access.

#### Rugged Landscape offering Diverse AAM Testing Environments

Remote areas, rugged landscape, diverse demographics, and weather conditions offering a range of testing and operating environments for AAM aircraft as they mature and pursue type certification

West Virginia’s neighboring states have seen a resurgence in commercial air travel in recent years, with Virginia experiencing a 49% increase in deplanements from 2021-2022, equating to 9 million more passengers arriving in Virginia annually. Ohio, Kentucky, and Pennsylvania have also seen double digit growth within that time, whereas West Virginia saw a modest growth of 7%.<sup>17</sup> The promising return on investment for aviation in West Virginia, paired with the slow growth of passenger air traffic in the state, offers demand for affordable AAM routes to drive growth in passenger traffic and state revenue.

West Virginia's landscape and demographics – spanning urban, suburban, and rural areas - offer a range of testing and operating environments for AAM aircraft as they mature and pursue type certification. As the National Academy of Sciences noted in its 2020 AAM National Blueprint, there is no suitable test airspace available on a dedicated basis for aerial mobility developers focused on commercial applications,<sup>18</sup> showing demand for a commercial test environment.

Over two dozen AAM aircraft and propulsion system manufacturers are currently engaging with the FAA, with nearly half of them reaching maturity levels for flying testbed prototypes.<sup>2</sup> West Virginia's mountainous regions and diverse topography paired with varying weather conditions throughout the seasons offer opportunities to test the agility, maneuverability, and stability of these aircraft in challenging landscapes and climates.

Additionally, remote areas in West Virginia where ambient noise levels are relatively low could provide test environments to assess

environmental impact of AAM including noise, which the FAA deems as one of the primary environmental challenges to the continued growth of aviation.<sup>2</sup>

The state's geographic hurdles and underserved communities create an opportune space for AAM services to bridge accessibility gaps. By leveraging the existing infrastructure and meeting the demand for alternative transportation, AAM services have the potential to revolutionize travel in the state.

With little competition in this sector and a receptive environment buoyed by state incentives, West Virginia has the opportunity to address its historical transportation limitations and potentially pioneer a futuristic approach to mobility, offering efficient, accessible, and innovative transportation solutions for its residents as a crucial hub for regional connectivity.

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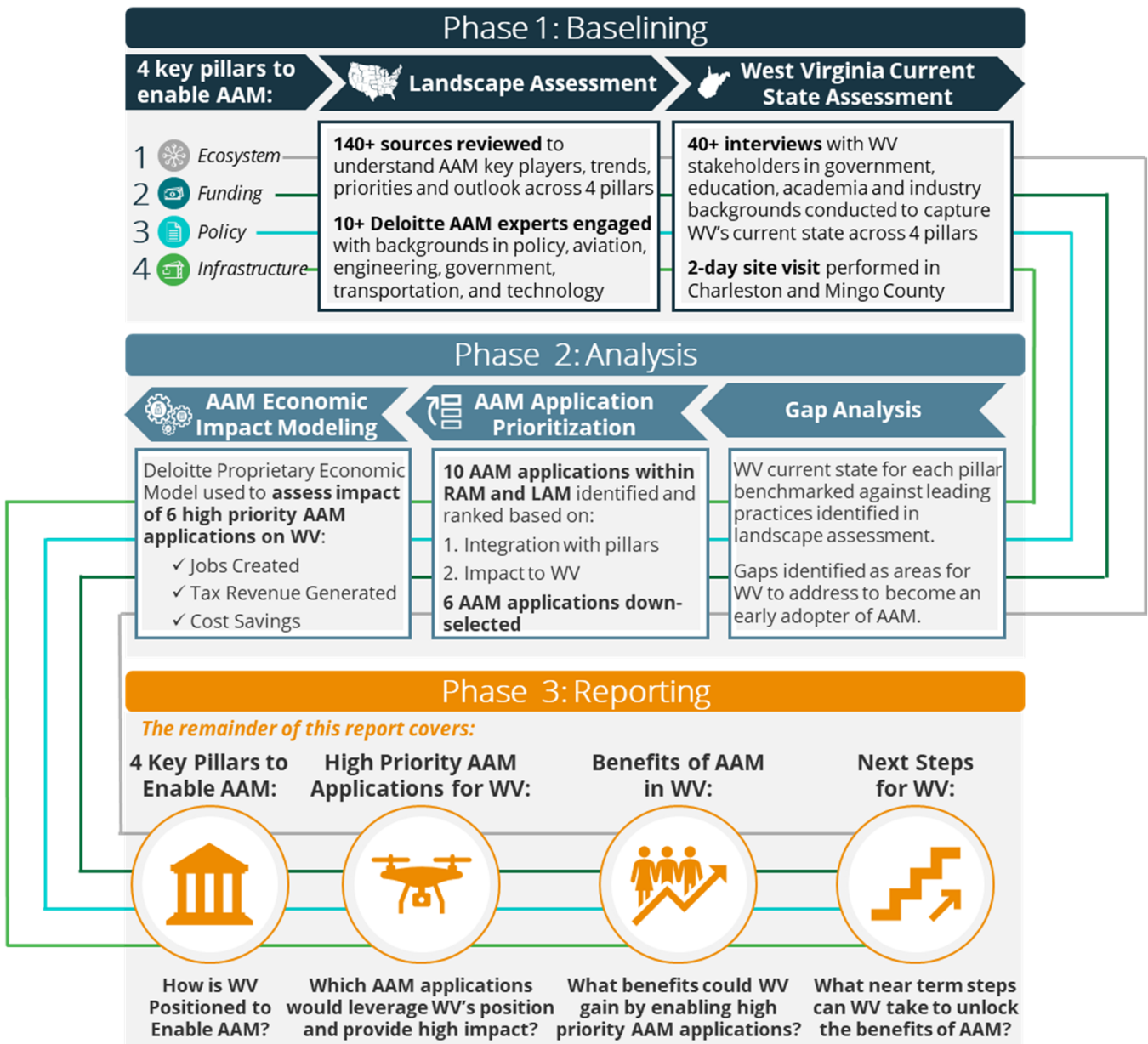
# Project Methodology

A three-phase approach to assess and harness AAM's potential in West Virginia

A three-phased approach was conducted to gain a holistic understanding of West Virginia's capabilities, needs, and advantages regarding AAM, as outlined below (Exhibit 5).

The common thread between each phase are the four key pillars for enabling AAM in a state - Funding, Ecosystem, Policy, and Infrastructure - which were considered throughout every project step.

**Exhibit 5: Project Methodology**



Phase 1 established a baseline by an AAM landscape assessment and a current state assessment of West Virginia. The landscape assessment included leveraging over 140 online sources and over ten AAM experts and SMEs to identify AAM players, state trends, national priorities and industry outlooks across the four key pillars. The project involved conducting over 40 interviews with West Virginian AAM stakeholders spanning government, education, academia, and industry backgrounds paired with a two-day site visit in Charleston and Mingo County. Insights from the interviews and site visits identified West Virginia’s current assets and enablers across the four pillars that could be leveraged for AAM.

The baseline established in Phase 1 was analyzed in Phase 2 through a gap analysis, AAM application prioritization, and economic impact modeling. The gap analysis benchmarked West Virginia’s current state of each pillar to leading practices identified by the landscape analysis; comparing West Virginia to other states and AAM leaders. The discrepancies between West Virginia’s current state and the benchmarks were categorized as gaps, pointing to opportunities for development for West Virginia to address in each pillar to position itself as an early adopter of AAM.

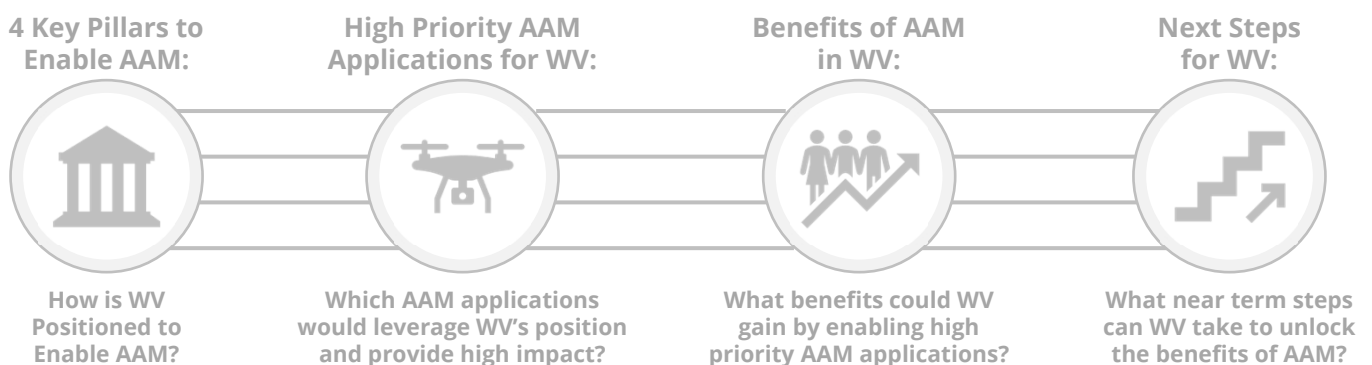
The AAM application prioritization step identified and ranked ten AAM applications within the RAM and LAM application categories (e.g. last-mile package delivery or regional commuter transportation) considered most relevant to West Virginia’s capabilities and needs. The applications were assessed based on two goals:

- 1) Integration into West Virginia’s current assets across each pillar
- 2) Impact to West Virginians

Six AAM applications emerged as high priority for West Virginia, which were then inputted to a proprietary economic model to determine the economic benefits that would be generated in West Virginia if the state enabled those AAM applications.

The insights from Phase 2 were used to inform the remainder of this report, which outlines West Virginia’s current position and progress towards becoming an early adopter of AAM, the high-priority AAM applications West Virginia should consider, the benefits West Virginia would gain by enabling the high-priority AAM applications, and next steps for West Virginia to unlock those benefits.

The following section will highlight and benchmark West Virginia’s current AAM enablers across four key pillars: Ecosystem, Funding, Policy, and Infrastructure, answering the question **“How is West Virginia currently positioned to enable AAM?”**



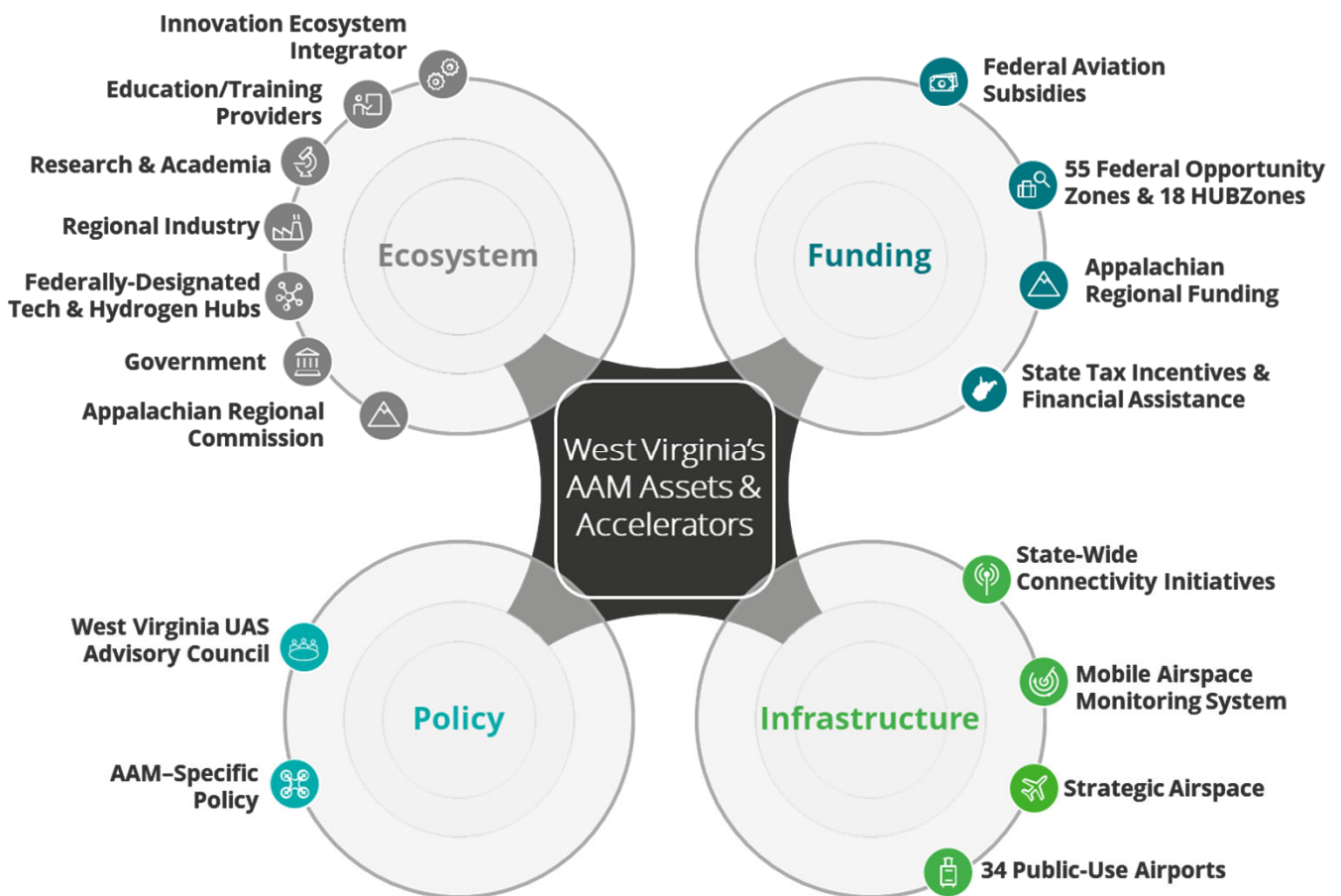
## Four Key Pillars for Enabling AAM in West Virginia

How is West Virginia currently positioned to enable AAM?

With several nationally recognized assets and accelerators (Exhibit 6), West Virginia holds potential to become an early adopter. This segment delves into a comprehensive examination of West Virginia's capabilities within the foundational pillars that are vital for fostering AAM: Ecosystem, Funding, Policy, and Infrastructure.

By methodically comparing these assets to the established benchmarks from leading states in AAM, this section aims not only to map out West Virginia's current standing, but also to pinpoint strategic areas that require attention and development. Through this analytical benchmarking, the report seeks to craft a pathway for West Virginia to fully realize and harness its potential in the AAM space.

**Exhibit 6: West Virginia's AAM Assets and Accelerators**



## Ecosystem

### West Virginia’s Current AAM Ecosystem

A diverse and collaborative ecosystem across the state is needed to enable AAM. As the industry continues to mature, the environment required to accelerate and sustain AAM capability will also expand.

West Virginia has a vast network of organizations across academia, private industry, and government that could each play a role in the development of AAM capabilities, generating distinct benefits for each stakeholder if properly coordinated (Exhibit 7).

#### Innovation Ecosystem Integrator

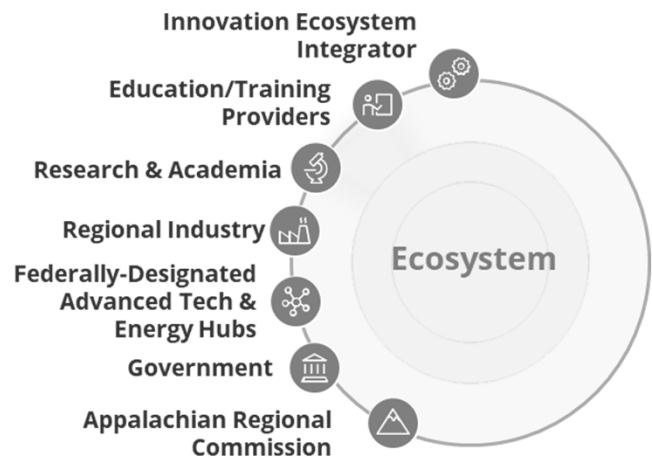
Vertx Partners is an innovation ecosystem integrator, providing leadership in the advancement of AAM in West Virginia. By forging strategic partnerships across industry, academia, and government, Vertx Partners is dedicated to fostering innovation, collaboration, and sustainable economic growth in the state. Their role as an integrator is evident in initiatives like orchestrating the inaugural Aerospace, Aviation, and AAM Coalition meeting in 2023, emphasizing the intersection of statewide education and industry to propel the growth of AAM.<sup>19</sup>

#### Education/Training Providers

Foundational to this extensive network, West Virginia provides an array of educational and training programs, encompassing primary through post-secondary levels. While not specifically established for AAM, these programs have the potential to be aligned and effectively utilized to develop a robust and resilient workforce.

For grades K-16, the Mingo County Redevelopment Authority, in collaboration with Marshall University and Vertx Partners, is developing and will pilot a NASA-funded AAM curriculum to be deployed across the entire state.<sup>20</sup> West Virginia also offers several post-secondary programs for vocational training, apprenticeships, or advanced degrees in AAM-related fields.

**Exhibit 7: West Virginia’s AAM Ecosystem**



- 
**Innovation Ecosystem Integrator**  
*Vertx Partners builds partnerships to foster innovation, collaboration, and sustainable economic growth in WV*
- 
**Education & Training**  
*K-16 AAM & STEM curriculum, Marshall Advanced Manufacturing Center, Bill Noe Flight School, Southern West Virginia CTC Drone Technology Course, Blue Ridge CTC Applied UAS Technologies Certificate, Fairmont State University Aviation Center of Excellence, Pierpont CTC Aviation Maintenance Program*
- 
**Research & Academia**  
*West Virginia University, Marshall University, ASSUREd Safe*
- 
**Regional Industry**  
*Mid-Atlantic Aerospace Complex (MAAC), Aerospace, Manufacturing, Energy*
- 
**Federally-Designated Advanced Tech & Energy Hubs**  
*Ecosystem clusters to drive rapid growth in advanced industrial technology and alternative energy*
- 
**Government**  
*State & local government efforts for transportation & infrastructure development, economic growth*
- 
**Appalachian Regional Commission**  
*Economic development partnership between Federal government and 13 state governments in Appalachia*

For example, Marshall University’s Advanced Manufacturing Center provides hands-on training in advanced machining and welding<sup>21</sup> – trades that are essential for fabricating AAM technologies. Marshall also offers the Bill Noe Flight School and the Aviation Maintenance Technology program, both integrating UAS into their curriculum and using commercial-grade UAS for hands-on training.

Additionally, both Southern West Virginia Community and Technical College (SWVCTC) and Blue Ridge Community and Technical College offers UAS courses which have been selected by the FAA's UAS College Training Initiative as programs that prepare students for careers with drones.<sup>22</sup> These are just a few examples of programs that build knowledge, complementary to traditional research and academia, to develop a well-rounded AAM education across the workforce.

### **Research & Academia**

Multiple universities in West Virginia are also conducting research in technologies that will be integral to AAM advancement. This includes West Virginia University's (WVU) research in UAS – a category of AAM aircraft – spanning UAS design, flight testing, and mission planning with support from federal agencies such as NASA and the Defense Advanced Research Projects Agency (DARPA).<sup>23</sup> Researchers at Marshall University received funding from the NASA West Virginia Space Grant Consortium to investigate potential vulnerabilities and threats to wireless communications for drones,<sup>24</sup> which must be mitigated for safe AAM operations. Mississippi State University and their Centers and Institutes such as the FAA's Alliance for System Safety of UAS through Research Excellence (ASSURE) and the Advanced Composite Institute (ACI) are also actively engaged in West Virginia. Through the ASSURED Safe program, West Virginia is helping to advance the standards, education, training, testing, certification and credentialing of first responders' use of UAS for public safety and disaster operations while advancing innovative and high-tech composite manufacturing through the ACI.<sup>25</sup>

### **Regional Industry**

Complementing these academic efforts, West Virginia's well-established manufacturing and aerospace industry could support several phases of the AAM supply chain or leverage AAM in their current operations. Examples of aerospace manufacturing facilities throughout the state include Pratt & Whitney, Aurora Flight Sciences – a Boeing Company,

Lockheed Martin, Northrop Grumman and Collins Aerospace<sup>26</sup> which significantly contribute to West Virginia's \$1.35 billion annual aerospace industry. Historically adding \$486 million to the state's GDP and over \$24 million in state and local taxes.<sup>27</sup>

The Mid-Atlantic Aerospace Complex (MAAC) and the North Central West Virginia AeroTech Park, both strategically located at North Central West Virginia Airport (CKB), additionally contribute significantly to this network. MAAC is home to 11-member aerospace companies specializing in maintenance, overhaul, manufacturing, or training capabilities. The complex is a major economic driver for the region, employing over 1,300 in aviation jobs and generating an economic impact exceeding \$1 billion.<sup>28</sup> The impact of the aerospace industry presence at CKB continues to grow, with the AeroTech Park planning the construction of a new airport terminal, a 100-acre Tech Park, and a new parking facility. The development of the park is projected to create over 1,000 jobs, and potentially double the airports annual economic impact to more than \$2 billion.<sup>29 30</sup> Both entities aspire to significantly increase their economic contribution to the region, and depending on market appetite, could play a big role in expanding and welcoming industry to the state to play within the AAM space

### **Federally-Designated Advanced Tech & Energy Hubs**

Supporting West Virginia's manufacturing and aerospace sectors, there are federally designated industrial technology manufacturing and energy ecosystem clusters. These clusters function as enablers, providing critical technologies and resources for the manufacturing and powering of AAM aircraft and infrastructure. The West Virginia Advanced Energy and Industrial Technology Manufacturing (WV-AEIM) Hub was awarded in 2023 under the CHIPS and Science Act to bring together members from industry, academia, and government to establish advanced energy and material manufacturing and emerging technologies in United States while building a resilient supply chain across West Virginia.



This includes a focus on advanced energy storage solutions and carbon and graphite materials,<sup>31</sup> which are supporting components for various AAM aircraft designs. The Appalachian Regional Clean Hydrogen Hub (ARCH2) was established with \$925 million in 2023 by the Department of Energy to create a network of hydrogen-based energy and products manufacturing.<sup>32</sup> Programs such as these bring together ecosystem players that could provide alternative energy for powering AAM aircraft and significantly reduce carbon emissions.

### **Government**

In addition to Federal efforts, West Virginia hosts several state and local government departments and initiatives that could contribute to AAM efforts in the state. For example, by combining previously separate divisions in 2022, the West Virginia DOT established their Division of Multimodal Transportation Facilities - focused on ports, aeronautics, public transit, and the railway - to promote close cooperation between agencies.<sup>33</sup> This streamlined approach allows for more effective coordination and communication between sectors such as aeronautics and public transit, creating an environment conducive to AAM development. Shortly after its establishment, the Division of Multimodal Transportation Facilities provided a funding match for the expansion of West Virginia International Yeager Airport (CRW), demonstrating a priority of expanding the aviation sector in the state<sup>34</sup>, which is a critical component of AAM. This integrated approach not only enhances infrastructure development but also signals a strategic priority to bolster the state's aviation capabilities, aligning with the broader goals of AAM expansion and regional connectivity. The West Virginia DOT also conducts LAM operations with a dedicated team of two full-time and 20 part-time pilots, managing a fleet of 18 aircraft for mapping and media operations.<sup>35</sup> This showcases a proactive approach to leveraging AAM technologies and recognizing the benefits they can provide.

The Mingo County Redevelopment Authority stands out as a significant advocate for AAM, with the previously mentioned K-16 AAM curriculum development being just one of three initiatives they are advancing through a \$2.9 million NASA grant secured via Congressionally Directed Spending. The Mingo County Redevelopment Authority is also supporting the development of state-wide programs that encourage AAM-related entrepreneurship (e.g. tourism activities) as well as a low-cost, mobile airspace monitoring system<sup>36</sup> that is discussed further in the Infrastructure Section. Each initiative is set to start in Mingo County and then be scaled state-wide, demonstrating Mingo County's commitment to leading the way in AAM for West Virginia.

### **Appalachian Regional Commission (ARC)**

As the only state completely within the Appalachian region, West Virginia has access and involvement in the Appalachian Regional Commission (ARC), which is an economic development partnership between the federal government and 13 state governments that make up Appalachia. In West Virginia, the ARC grant program is managed by the State Development Office, which collaborates with the Governor's office and local participants to provide financial and technical assistance for various projects aimed at economic development and infrastructure enhancement.<sup>37</sup>

## AAM Ecosystem Benchmarks: Learning from other states

West Virginia has a distinct ecosystem across the state that could enable AAM and generate benefits for each stakeholder if properly organized and mobilized. A landscape assessment of other states' AAM ecosystems uncovered three primary benchmarks to assess West Virginia's progress towards becoming an early adopter of AAM (Exhibit 8).

### AAM Focal Point within State Government

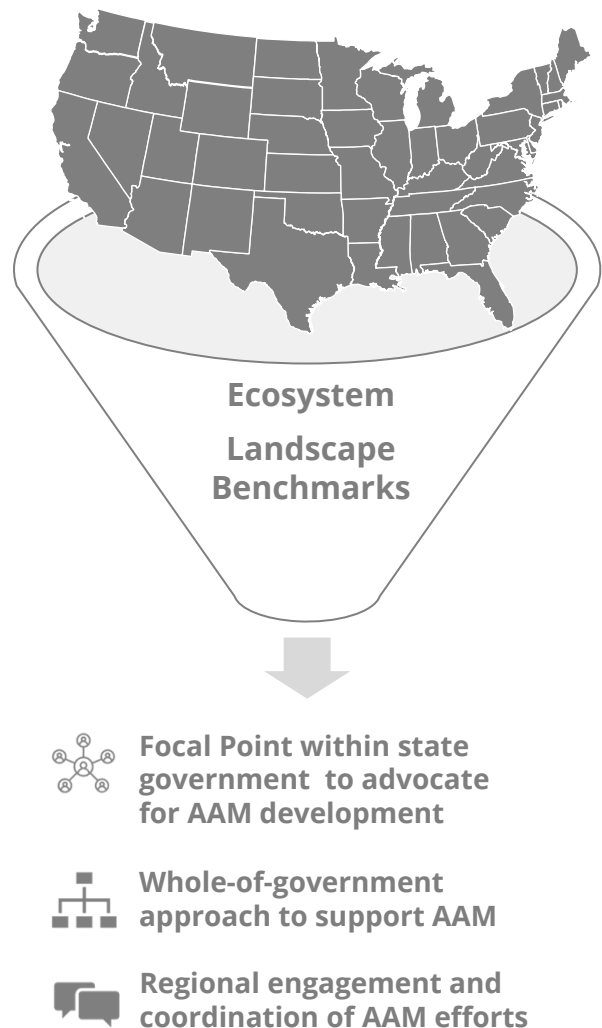
A designated full time AAM focal point within state government plays a pivotal role in coordinating AAM efforts across departments to enable tailored policies, efficient resource allocation, and targeted stakeholder engagement.

By serving as a liaison between industry, academia, and government entities, this focal point advocates for AAM, attracts investments, and drives economic development. Its overarching aim is to harness the transformative potential of AAM technologies by ensuring cohesive strategies, fostering partnerships, and promoting the state's commitment to innovation and economic growth. The positioning of the AAM focal point within state government varies based on state government structure and priorities, with many leading states establishing an AAM focal point within an agency, authority or department closely tied to transportation, economic development, or technology innovation. An example of this is the Ohio DOT's UAS Center, which serves as the state's hub for uncrewed aircraft and advanced aviation technologies and sits within the National Advanced Air Mobility Center of Excellence. The UAS Center manages innovation initiatives including the FlyOhio initiative – a coalition of stakeholders focused on enabling AAM in the state – while also performing all UAS operations for the DOT.<sup>38</sup>

### Whole-of-Government Approach

A whole-of-government approach at the state level is critical as AAM spans multiple sectors and jurisdictions including technology, transportation, infrastructure, economic development, and regulations. A coordinated and strategic AAM approach across state agencies and departments – with leadership by the AAM focal point – promotes policy

## Exhibit 8: Ecosystem Landscape Benchmarks



consistency, streamlined resource allocation, and stakeholder collaboration.

This coordinated strategy prevents conflicting policies, fosters a supportive regulatory environment, and maximizes economic impact by attracting investments, driving innovation, and creating job opportunities. Moreover, it promotes protocols, efficient airspace management, and the seamless integration of AAM aircraft, positioning the state to leverage the transformative potential of AAM across diverse sectors.

## Regional Engagement and Coordination of AAM Efforts

Successful development of AAM, especially for regional travel beyond state lines (such as RAM), requires vital coordination across state governments. To unlock the full potential of AAM at a national level, states must harmonize their efforts in areas including policy, funding, and infrastructure development. A unified approach facilitates consistent regulations, streamlining operations for AAM providers and promoting safe and efficient cross-border transportation. Additionally, collaborative funding mechanisms can optimize resource allocation, preventing disparities across states in infrastructure development and enhancing the overall reliability of the AAM network.

By aligning their strategies, state governments can collectively propel AAM forward, fostering a cohesive and mature ecosystem that transcends individual state boundaries, offering a more connected and accessible regional transportation network. An example of this is the AAM Multistate Collaborative launched in 2023, consisting of state aviation and aerospace officials from eight states, three of which border West Virginia: Virginia, Ohio, Pennsylvania, Oklahoma, Texas, Utah, Oregon and Alaska. The Collaborative is working to identify and harmonize the governance and regulatory mechanisms that are within each state's jurisdiction as a focal point to ensure continuity of operations. The group aims to expand its membership with representatives from additional states and to become a key information resource for others regarding methodologies and technologies to develop a nationwide AAM ecosystem<sup>39</sup>

## West Virginia's Ecosystem Opportunities for Development

Although West Virginia has several AAM advocates and stakeholders across industry and academia, the state government does not currently have a designated, full time AAM focal point that is dedicated to advocating for and coordinating AAM efforts across agencies and departments for a whole-of-government approach. West Virginia does have a UAS Advisory Council (which is described in further detail in the Policy section); however, the Council is not a full-time entity of government personnel. The West Virginia state government has strong ties to the broader Appalachian Region and engages in several regional coordination efforts for economic development, however, is not actively involved in AAM-specific regional efforts. By addressing these gaps, West Virginia can position itself as an early adopter of AAM.

## Funding

### West Virginia's Current AAM Funding Enablers

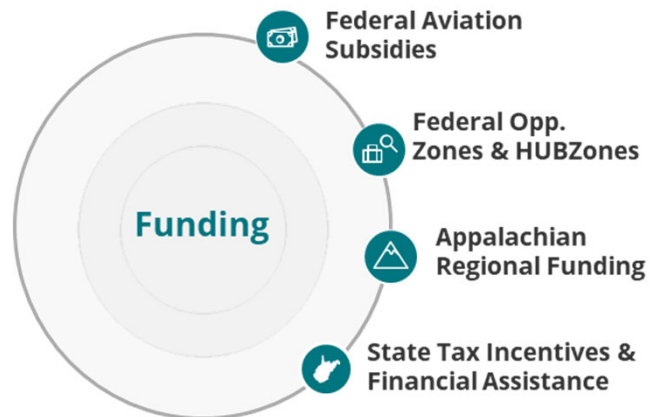
Dedicated funding for AAM activities and endeavors is essential for fostering a successful AAM industry in the state. This funding can come in various forms, such as financial support, incentives, or grants from federal, state, and local governments. West Virginia currently has several funding sources and financial mechanisms that could be leveraged to pioneer and foster the growth of AAM in the state (Exhibit 9). Each funding source or mechanism - whether public or private - offers opportunities and plays a distinctive role in shaping the trajectory of AAM development in the state.

#### Federal Aviation Subsidies

West Virginia currently benefits from federal aviation subsidies, which could potentially bolster AAM infrastructure development and operations. The FAA's Airport Improvement Program (AIP) provides funding for eligible airport infrastructure projects, aiming to enhance safety, capacity, and environmental sustainability of the airport. In 2022, this support was exemplified as four West Virginia airports collectively received nearly \$14 million from the AIP for various upgrades, including runway rehabilitation and extension.<sup>40</sup> For many small regional airports, the AIP provides a vital infusion of resources that maintain updates to the airport, which is an economic engine for the local area. When an airport falls below a certain enplanement threshold such as 10,000 boarding passengers, the funding can reduce significantly including close to a million dollars.<sup>41</sup> The loss of these funds can be detrimental to airports like Greenbrier Valley airport, which witnessed a drop to just 10,048 enplanements in 2022, down from the previous year.<sup>42</sup>

The U.S. DOT's Essential Air Service (EAS) program aims to maintain essential air service in smaller and remote communities. It subsidizes airlines for routes that might not be financially viable, maintaining air connectivity in underserved areas.

Exhibit 9: West Virginia's AAM Funding



#### Federal Aviation Subsidies

Many airports and communities in West Virginia qualify for DOT's Essential Air Services (EAS) Program, FAA's Airport Improvement Program (AIP)



#### 55 Federal Opportunity Zones, 18 HUBZones

Tax incentives and contract perks for investors or small businesses focusing on rural & low-income areas to support recovery and growth in distressed communities



#### Appalachian Regional Funding via ARC

Congressionally-appropriated grants to for economic development in Appalachian region, with emphasis on infrastructure and workforce development



#### State-Tax Incentives and Financial Assistance

Support for high-tech UAS manufacturers, aircraft valuation, creating economic opportunity, tourism development, infrastructure development and more

In West Virginia, the EAS supports communities like Clarksburg, where SkyWest operates flights under the United Express brand. Additionally, services by Contour Airlines at airports such as North Central West Virginia Airport in Clarksburg and Greenbrier Valley Airport in Lewisburg exemplify the EAS's role in enhancing accessibility and connection for these areas<sup>43 44</sup>

With the current regulatory environment, it is unclear if EAS and AIP can be leveraged

specifically for AAM, but those subsidies provide a potential avenue for expanding infrastructure and subsidizing commercial network of AAM operations in a high-demand, low-competition region. AAM could revitalize the aviation sector in West Virginia and keep airport deplanement numbers above required thresholds to qualify for these subsidies across the state's airport network. Such a network would not only exemplify accessible and sustainable air travel but also guarantee the vitality of smaller airports and communities, setting a precedent for future AAM frameworks.

### **55 Federally-Designated Opportunity Zones and 18 HUBZones**

The federal government has also designated 55 Opportunity Zones, certified by the U.S. Department of Treasury,<sup>45</sup> offering federal tax deferral benefits on capital gains for investors focusing on rural and low-income areas. The AAM industry has a significant opportunity in West Virginia's designated Opportunity Zones; by leveraging tax incentives within these zones, AAM companies can accelerate research and operation efforts while fostering job creation within these economically distressed areas and potentially enhancing mobility of people, goods and services in regions that have high demand for accessible transportation.

Similarly, West Virginia's HUBZones complement the Opportunity Zones, offering additional incentives and support for small businesses. HUBZones, or Historically Underutilized Business Zones, offer small businesses the opportunity to bid on federal contracts that are exclusively set aside. Additionally, HUBZones receive a 10% price evaluation preference when bidding on federal contracts, making them more competitive.<sup>46</sup> The program which aims to stimulate growth and development, could provide advantages for AAM companies looking to set up shop in West Virginia.

### **Appalachian Regional Funding via ARC**

In addition to federal resources, West Virginia also has access to regional funding mechanisms only available to the Appalachian region. The ARC's grants and initiatives use congressionally appropriated funds for economic development efforts in Appalachia. In 2022 alone the ARC and the West Virginia Development Office supported 61 projects in West Virginia with an ARC investment of \$42.9 million, resulting in the creation/retainment of over 2,550 jobs, training 7,590 students and workers, and benefitting 1.8 million residents in the state.<sup>47</sup> The ARC has five Core Investment Priorities – Building Business, Workforce Ecosystems, Community Infrastructure, Regional Culture and Tourism, and Leaders and Local Capacity – all of which can be supported by enabling AAM in the region. The ARC has supported AAM efforts in the past, including their 2023 grant to Ohio University to explore AAM opportunities for the region's business, transportation, medical and logistical needs.<sup>48</sup> Complementing these efforts, West Virginia's Local Development Districts within the ARC are dedicated to enhancing regional development through funding. Their strategies include upgrading transportation infrastructure, road safety, and managing the increase in general aviation traffic, which are particularly conducive to the integration of AAM.<sup>49 50</sup>

### **State Tax Incentives and Financial Assistance**

In addition to federal and regional funding opportunities, West Virginia offers several state tax incentives and financial assistance programs that could benefit the AAM industry. For instance, under WV Code §11-13Q-10a (2021), West Virginia provides a tax incentive for high-technology manufacturers. Eligible businesses engaged in the manufacturing of drones, uncrewed aircraft, autonomous motor vehicles, or high technology can utilize this incentive to receive a 100% tax credit against state taxes.<sup>51</sup>

Additionally, West Virginia provides an aircraft valuation benefit, allowing aircraft owned or leased by commercial airlines, charter carriers, private companies, and carriers to be assessed for property tax at the lower of the fair market salvage value or 5% of the property's original cost. Furthermore, West Virginia provides various business incentives, such as tax benefits for companies establishing corporate headquarters, tax credits for job creation, and financial assistance for tourism sector expansion, all conducive to attracting the AAM industry.

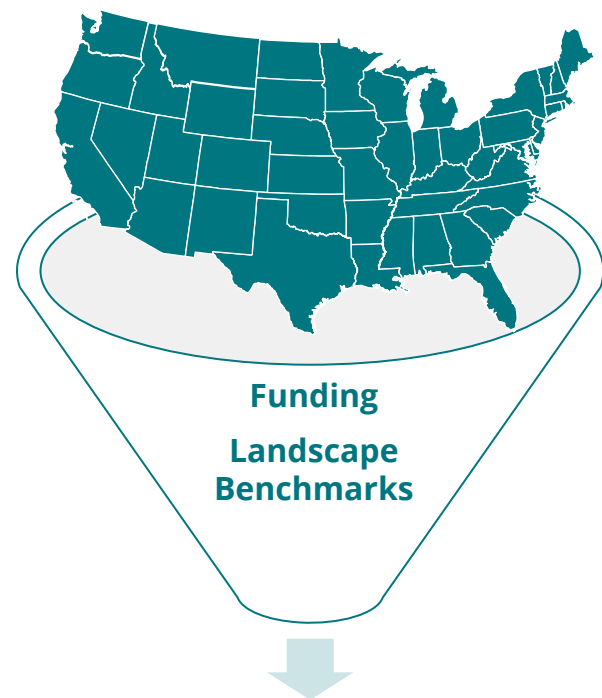
### AAM Funding Benchmarks: Learning from other states

West Virginia has an array of funding mechanisms already in place that could enable AAM if properly leveraged. A landscape assessment of other states' AAM funding practices uncovered one primary benchmark to assess West Virginia's progress towards becoming an early adopter of AAM (Exhibit 10).

Dedicated state funding for AAM is needed to foster innovation, infrastructure development, and workforce training specific to AAM technologies. This funding allows the state to actively participate in shaping the regulatory framework, invest in infrastructure conducive to AAM operations, attract industry stakeholders through incentives, and cultivate a skilled workforce, thereby stimulating economic growth and technological advancement while securing a competitive edge in the burgeoning AAM sector.

An example of this is the state of New York, which has dedicated state funds to a variety of AAM initiatives. Since 2016 their funding includes a \$35 million investment to develop a 50-mile UAS flight traffic management system, \$9 million for the Skydome indoor drone testing facility, and more than \$25 million for the GENIUS NY competition, which supports UAS entrepreneurs. New York also committed \$21 million in CNY Rising Upstate Revitalization Initiative funding to develop a UAS industry hub, including a partnership to create an

**Exhibit 10: Ecosystem Landscape Benchmarks**



**Dedicated state funding for AAM programs**



**Incentives for AAM Industry**

international AAM Corridor between Syracuse International Airport and Quebec, Canada.<sup>52 53</sup>

### Incentives for AAM Industry

AAM Industry incentives stimulate innovation, investment, and adoption of AAM technologies. These incentives provide the necessary financial support and motivation for private companies to invest in research, development, and infrastructure for AAM. By offering incentives, governments and regulatory bodies encourage the emergence of a competitive and dynamic market, fostering an environment ripe for the growth of AAM solutions. These initiatives not only attract established aerospace companies but also incentivize startups, leading to a diverse ecosystem that drives technological advancements and cost reductions.

An example of state and local AAM incentives in action is evident in Joby Aviation's announcement in 2023 to establish their first scaled manufacturing facility in Dayton, Ohio, facilitated by up to \$325 million in state and local incentives. Joby Aviation, a California-based AAM aircraft manufacturer, plans to invest up to \$500 million and create up to 2,000 jobs with their Ohio facility. Joby is expected to deliver up to 500 aircraft per year at the Dayton International Airport and use existing infrastructure to begin near-term operations.<sup>54</sup> This example highlights the impact of targeted financial support in positioning states as favorable hubs for AAM development, driving economic growth, job opportunities and enhanced transportation options for communities.

### **West Virginia's Funding Opportunities for Development**

West Virginia has access to a spectrum of federal and local funding sources, and several incentives in place that could be applied to the AAM industry. These existing mechanisms have laid a foundation for initial investments and have demonstrated the capacity to support AAM endeavors to some extent. However, to capitalize and sustain the growth of AAM, there is a discernible need for dedicated state funding streams to signal strong governmental commitment to the industry, attract additional private investment and stimulate job creation. By addressing these gaps, West Virginia can position itself as an early adopter of AAM.

## Policy

### West Virginia's Current AAM Policies

Policy is a key driver towards the development and support of an AAM R&D environment and commercial operations capability. Maturation of the AAM industry depends on policy and regulations that clearly define how this technology will be certified and integrated into an intermodal transportation system. In this regard, West Virginia currently has several policies and legislative measures that foster an environment for AAM testing and operations. It is necessary, therefore, to have focused leadership who become stewards of these AAM policies. This is necessary and relevant, preventing them from becoming barriers (Exhibit 11).

#### West Virginia UAS Advisory Council

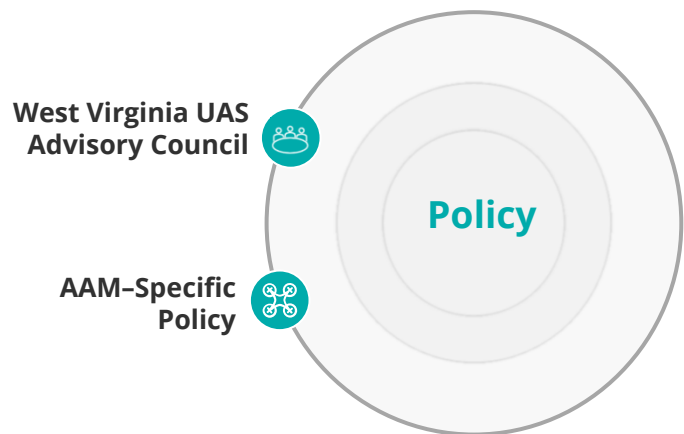
Central to these measures is the West Virginia UAS Advisory Council, which was formed in 2022 within the Department of Economic Development.<sup>55</sup>

Comprising volunteer members from diverse sectors like transportation, the UAS and AAM industries, and academia, the council focuses on staying current with trends and technologies. This knowledge enables them to develop targeted strategies for the AAM industry's growth in the state, and by recommending legislation tailored to the unique needs of AAM, the council promotes a supportive regulatory environment. Their efforts go a step further in fostering public awareness and cross-sector collaboration for sustainable advancement of the sector, aligning innovation with public and government expectation.

#### AAM-Specific Policies

West Virginia's legislative framework includes two statutes that are specific to AAM: WV Code § 5B-2-18a (2022) and WV Code § 5B-2M-1 (2022). WV Code § 5B-2-18a (2022) prohibits counties and municipalities from independently regulating or restricting AAM activities, promoting a unified AAM regulatory approach across the state.

### Exhibit 11: West Virginia's AAM Policies



#### West Virginia UAS Advisory Council

*Council within the WV Department of Economic Development, representing UAS and AAM industry, academia, and transportation. Tasked with informing policy and strategy*



#### AAM-Specific Policies

*WV Code § 5B-2-18a (2022) prohibits local restrictions on AAM aircraft. WV Code § 5B-2M-1 (2022) promotes the development of a network of vertiports to provide equitable AAM passenger and cargo operations access to citizens.*

WV Code § 5B-2M-1 (2022) promotes the development of a network of vertiports that will provide equitable access to citizens of West Virginia who may benefit from AAM operations for cargo and passenger service.<sup>56</sup> Together these bills enable the safe and equitable integration of AAM into West Virginia's transportation system, mitigating the risk of fragmented local barriers.<sup>57</sup> In developing these policies, lawmakers in West Virginia showed receptiveness to the perspectives and advocacy efforts of major organizations representing the AAM industry.<sup>58</sup>



## AAM Policy Benchmarks: Learning from other states

A landscape assessment of other states' AAM policy practices uncovered two primary benchmarks to assess West Virginia's progress towards becoming an early adopter of AAM (Exhibit 12).

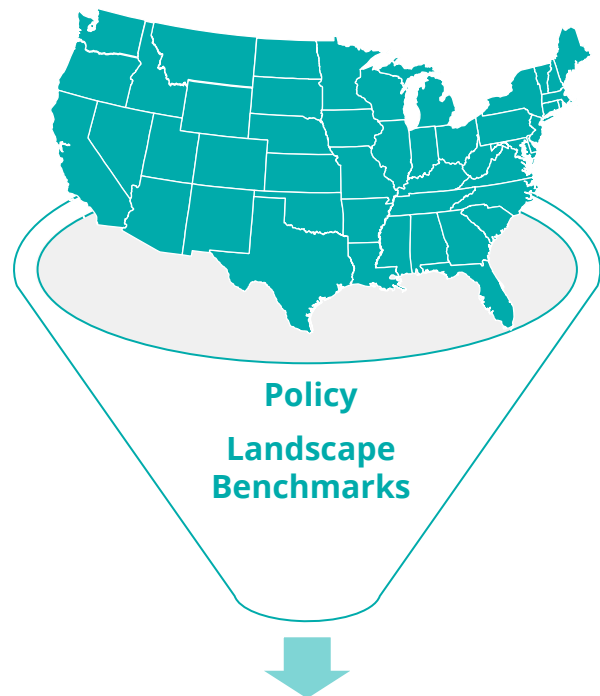
### AAM Working Group Dedicated to Coordination & Integration

An AAM Working Group, comprising a diverse group of stakeholders, is essential for a thriving AAM industry. Working Groups play an important role in shaping a comprehensive strategy and recommend policies by bringing together industry experts, community representatives, and policymakers to collaboratively discuss, analyze, and consider all stakeholder perspectives. This collaborative approach facilitates the identification of potential challenges, addresses concerns, and maximizes the overall benefits of AAM for everyone involved, leading to more effective, informed, and equitable policies.

An AAM Working Group serves primarily in an advisory and coordination capacity, informing and recommending state strategy and legislation. Once the Working Group provides recommendations, a designated AAM Focal Point within state government (described in the ecosystem section) has the authority to act on those recommendations, coordinating across state government in developing regulations, overseeing AAM operations, ensuring safety and compliance, managing related funding and resources, and integrating into relevant state plans and strategies.

For example, the Florida DOT Aviation Office published an AAM Implementation Plan in 2023, which details and prioritizes 18 recommendations made to them by the Florida AAM Working Group. The plan identifies state departments that would be responsible to execute each recommendation,<sup>59</sup> demonstrating effective coordination between the advisory role of the AAM Working Group and the authority of the FDOT Aviation Office as an AAM Focal Point within state government.

Exhibit 12: Ecosystem Landscape Benchmarks



 **AAM Working Group dedicated to shaping legislation**

 **Legislation to support the growth of AAM industry**

### Legislation to Support AAM Industry Growth

Legislation plays a crucial role in fostering the growth of the AAM industry by providing a structured framework that addresses safety, regulatory compliance, and operational standards.

Clear and supportive legislation establishes a predictable environment, instilling confidence among investors, manufacturers, and operators. It mitigates uncertainties, facilitates innovation, and guarantees the safe integration of AAM technologies into existing transportation systems. Moreover, well-crafted legislation helps streamline approval processes, reducing barriers for market entry and encouraging competition. This legal foundation not only safeguards public safety and privacy but also promotes responsible industry development, attracting talent, investment, and collaboration essential for the sustained and successful evolution of the AAM sector.

As demonstrated in the development of West Virginia's AAM policies, there are AAM industry advocacy groups that engage with federal, state, and local law-makers to promote AAM regulations that foster innovation and U.S. competitiveness. One example of state legislation that such advocacy groups recognized as favorable to AAM is Mississippi's UAS Rights and Authorities Act passed in 2023, which codifies that ultimate airspace authority lies with the FAA fostering a harmonized regulatory environment.<sup>60</sup> Supportive legislative environments that arise from participation in AAM industry groups pave the way for innovation, investment, and the collaboration needed for sustained growth and competitiveness.

## West Virginia Policy Opportunities for Development

West Virginia's establishment of the UAS Advisory Council as well as supportive policies provide a promising foundation for attracting and maturing the AAM industry. However, without an AAM Focal Point within the state government (as highlighted previously in the Ecosystem Section), recommendations made by the UAS Advisory Council may lack traction or coordinated execution across state government efforts. By addressing this gap, West Virginia can position itself as an early adopter of AAM.

## Infrastructure

### West Virginia's Current AAM Infrastructure

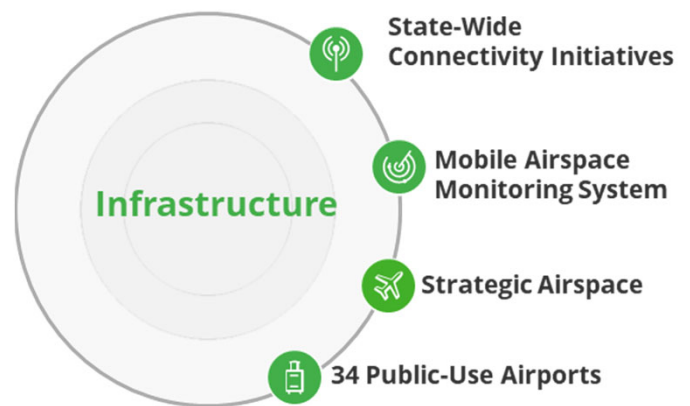
A network of technologies, systems, and supporting structures/facilities are needed to enable safe AAM R&D and operations. As AAM technologies and capabilities continue to develop and mature, states need to strategically plan and develop proper supporting infrastructure. West Virginia currently has development efforts that could be leveraged for AAM R&D and operations if properly coordinated (Exhibit 13).

#### State-Wide Connectivity Initiatives

West Virginia has multiple state-wide connectivity initiatives to promote communications, system interoperability, and expand network coverage, which are central for AAM command and control capabilities. The West Virginia Statewide Interoperable Radio Network (SIRN) forms an important part of the state's communication infrastructure. SIRN, a collaboration among various public safety entities, aims to provide interoperable radio network coverage across the state. While its extensive coverage supports most of West Virginia, there are ongoing efforts to expand this reach, acknowledging the state's challenging terrain.<sup>61</sup> There are also limitations imposed by the National Radio Quiet Zone (NRQZ), which limits certain frequencies to protect radio telescope operations.<sup>62</sup> For AAM, SIRN's interoperability and expanding coverage are key for reliable cross-agency communication, vital in managing complex aerial mobility operations safely and efficiently.

Another state-wide connectivity initiative is the Broadband Equity Access and Deployment (BEAD) Five-Year Action Plan. With a \$1.2 billion backing from the National Telecommunications and Information Administration (NTIA), BEAD is set to revolutionize West Virginia's connectivity infrastructure.<sup>63</sup> This plan is pivotal for AAM development, as high-speed, dependable internet is fundamental for effective communication, data management, and coordination among AAM stakeholders.

### Exhibit 13: West Virginia's AAM Infrastructure



#### State-Wide Connectivity Initiatives

*Statewide Interoperable Radio Network (SIRN) and the Broadband Equity Access and Deployment (BEAD) efforts plan to expand communication infrastructure and connectivity across the state, essential for safe and efficient AAM operations*



#### Mobile Airspace Monitoring System

*Development of a NASA funded, mobile airspace monitoring system for AAM at the Southern West Virginia Regional Airport, featuring advanced surveillance and communication technology, aims to boost safety, efficiency, and educational opportunities in the AAM sector*



#### Strategic Airspace

*Within 500-mile radius of 40% of U.S. population, between several population centers, military training routes*



#### 34 Public-Use Airports

*34 airports for public use, 23 of which are in the FAA NPIAS and recognized as integral to passenger travel and the state's economic vitality. Several airport infrastructure maintenance and expansion efforts*

The BEAD program is a culmination of state-level planning and engagement and is poised to not only bridge digital divides but also to underpin the burgeoning AAM ecosystem in West Virginia.

#### Mobile Airspace Monitoring System

Complementing these digital infrastructure advancements is the development of a mobile airspace monitoring system, intended to provide low altitude airspace management at pilot sites like Southern West Virginia Regional Airport (EBD). This project includes operator stations, telescoping masts for surveillance, and a comprehensive communication suite. Designed for low altitude airspace management, it's vital for AAM

operations. The system's mobility enhances its utility, offering adaptable training and operational support across West Virginia.

### **Strategic Airspace**

In addition to ground-based infrastructure, West Virginia's airspace offers opportunities for the advancement of AAM due to its location within a 500-mile radius of nearly 40% of the U.S. population.<sup>11</sup> This geographic positioning could make the state a central hub for AAM corridors, providing swift connections to major urban centers and extensive coverage across a large portion of the nation's populace.

Additionally, the presence of strategic military training areas<sup>65</sup> suggests the region is already accustomed to a certain level of airspace management complexity, which could be advantageous when implementing new systems like AAM.

### **34 Public-Use Airports**

West Virginia's airport infrastructure offers both diversity and growth potential. The state boasts 34 public-use airports, 23 of which are in the FAA NPIAS and recognized as integral to both passenger travel and the state's economic vitality. Key airports in West Virginia are undergoing developments to prepare for aviation advancements and growth by modernizing rural airport infrastructure.

Charleston's CRW is extending its runway,<sup>66</sup> while Raleigh County Memorial Airport (BKW) is developing business-ready sites, both reflecting the potential for an AAM-friendly environment. Additionally, a new terminal at CKB and an extra 50 acres for economic development highlight this opportunity.<sup>67</sup>

These advancements present an opportunity for significant industry investment. Stakeholders within the AAM ecosystem are not only expressing a readiness to contribute financially to infrastructure upgrades but are eager to invest in building the initial infrastructure. This investment is particularly focused on areas demonstrating a growing demand for AAM services and within a supportive policy framework. Their willingness to invest upfront indicates a strong belief in the potential of revenue generation from future operations in these high demand areas.

The relationship between public infrastructure development and private sector engagement is symbiotic, and such collaboration could accelerate the modernization of these airports, increasing their value as assets to the state. In recognition of their role in regional economic development, five rural West Virginia airports in Upshur, Braxton, Grant, Mercer, and Logan counties have received a total of \$511,427 in Airport Infrastructure Grants from the FAA. This funding, sourced from the bipartisan Infrastructure Investment and Jobs Act, is aimed at developing local airports to meet customer needs, enhance safety, and support state growth.<sup>68 69 70</sup>

## AAM Infrastructure Benchmarks: Learning from other states

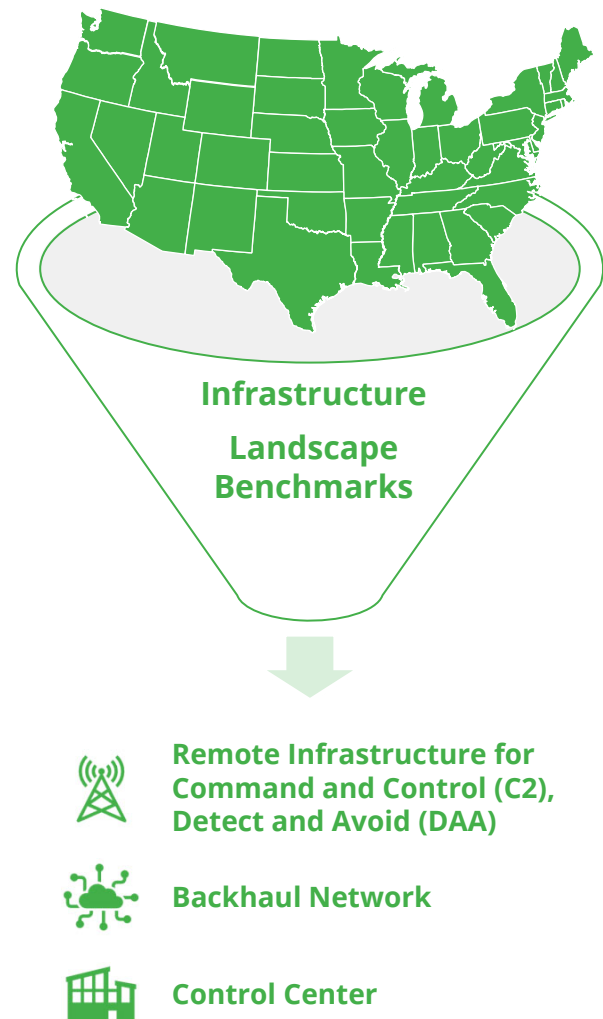
West Virginia has a combination of infrastructure and development efforts that could enable AAM if properly coordinated and supported. A landscape assessment of other states' AAM infrastructure efforts uncovered three primary benchmarks to assess West Virginia's progress towards becoming an early adopter of AAM (Exhibit 14).

AAM requires foundational infrastructure akin to traditional aviation, but with key advancements and integrated technologies to accommodate an increasingly crowded airspace that will include remotely piloted and autonomous aircraft. An example of an AAM infrastructure network under development is Choctaw Nation of Oklahoma's Emerging Aviation Technology Center, which spans over 44,600 acres and will include remote infrastructure such as radar and broadband.<sup>71</sup> North Dakota's Vantis network provides an example of an existing state-wide AAM infrastructure network, comprised of remote infrastructure, a backhaul data network, and a mission and network operations center.<sup>72</sup>

### Remote Infrastructure

Remote infrastructure for aircraft command and control (C2) capabilities as well as airspace surveillance is foundational for safe and efficient AAM operations. C2 enables real-time communication between AAM aircraft, ground systems, and air traffic management, ensuring coordinated and secure operations in shared airspace. Several types of networks are being explored for C2 for AAM applications, including cellular networks, satellite coverage, and dedicated radio frequencies. Each network type serves specific needs based on coverage, reliability, latency, security, and adaptability, catering to the diverse operational requirements of AAM aircraft across different environments and scenarios. Detect and Avoid (DAA) capabilities are critical to prevent aircraft collisions and make sure there is safe separation between aircraft in flight. For traditional aviation, DAA relies on a combination of pilots' visual

## Exhibit 14: Infrastructure Landscape Benchmarks



observations, radar systems, and air traffic control directives to prevent collisions.

However, for AAM, DAA capabilities must be able to accommodate an increasingly crowded airspace that includes uncrewed and/or autonomous aircraft, reducing reliance on pilots' visual observations. Several DAA capabilities for AAM are being explored including onboard aircraft systems, traditional ground-based systems such as radar, and novel ground-based systems such as remote air traffic control tower systems.<sup>73</sup>

### Backhaul AAM Data Network

AAM data captured and transmitted across remote infrastructure must be tied together by a backhaul data network. A backhaul data

data network serves as the communication backbone for AAM, transmitting real-time data between aerial aircraft, ground control stations, and traffic management systems. It enables seamless information exchange, facilitating traffic coordination, route planning, and safety measures. This network provides continual situational awareness for operators and automated systems, supporting informed decision-making and timely responses to airspace changes. A robust backhaul data network is essential for AAM for safety, scalability, redundancy, and reliable connectivity, enabling efficient and secure operations in shared airspace.

### Remote Control Center

A Remote Control Center (RCC) is the operational heart of AAM, akin to the nerve center that monitors, controls, and facilitates the testing and operational integrity of remote infrastructure. The RCC is responsible for real-time management of a complex ecosystem that includes C2 systems, traffic management, communication networks, and DAA systems.

For instance, NASA’s Mobile Operations Facility (MOF), a mobile mission control center on wheels, is a prototype of an RCC that can travel to any flight-testing site to gather critical data and support the integration of air taxis and cargo delivery into the National Airspace

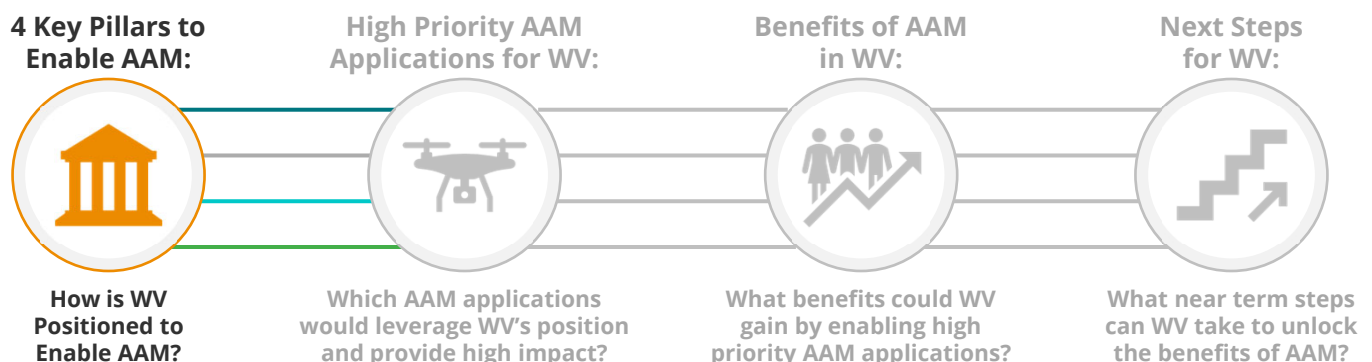
System. This facility has been outfitted with sophisticated communication and monitoring equipment that can provide a template for statewide AAM operations. The MOF’s capabilities include a portable power generator and satellite data connectivity, enabling real-time monitoring of flight testing and the flexibility to adapt to any test location, thus demonstrating the RCC’s potential to oversee a broad variety of AAM use cases across urban, rural, and regional domains.<sup>74</sup>

The development of a Remote Control Center within West Virginia could centralize AAM operations, streamline the testing of advanced aircraft, and make certain the safe and coordinated integration of AAM into existing airspace.

### West Virginia Infrastructure Areas for Development

West Virginia offers remote infrastructure that could be leveraged for AAM but lacks an organized approach to coordinate and integrate across these development efforts and networks. Addressing this gap would position West Virginia to enhance its communication and connectivity capabilities, potentially supporting a sophisticated AAM system, optimizing the flow of information and supporting seamless communication between various AAM stakeholders.

This section highlighted and benchmarked West Virginia’s current AAM enablers across four key pillars: Ecosystem, Funding, Policy, and Infrastructure, answering the question **“How is West Virginia currently positioned to enable AAM?”** The following section will explore and prioritize AAM applications for West Virginia to answer the question **“Which AAM applications would best leverage West Virginia’s position and provide maximum impact to the state?”**



## High-Priority AAM Applications for West Virginia

Which AAM applications could leverage West Virginia’s position and provide maximum impact to the state?

AAM and its three application categories – RAM, LAM, and UAM – encompass a growing range of applications that span several sectors and industries. With current and future AAM applications ranging anywhere from small drones delivering medical supplies to flying taxis transporting people to tourism hubs, it is important for West Virginia to prioritize and strategically enable applications that provide strong benefits to the state while leveraging their current assets and accelerators.

This section explores an initial list of ten AAM applications considered most relevant to West Virginia based on stakeholder interviews and current state analysis. Then, this section states the assumptions made in assessing each application and details the criteria used to rank and down-select the applications. Finally, this section presents the final six down-selected applications (Exhibit 15), considered high priority for West Virginia to strategically enable.

### Exhibit 15: High Priority AAM Applications for West Virginia



#### Utility and Infrastructure

The use of UAS for inspecting and monitoring utilities and infrastructure



#### Public Operations

The use of UAS by public servants for “dull, dirty or dangerous tasks” e.g. emergency response, law enforcement, surveying



#### Medevac

The swift transportation of patients between hospitals via aircraft



#### Cargo Feeder (Hybrid)

Regional air transportation of cargo via hybrid powered aircraft



#### Medical Logistics

The rapid and efficient transportation of medical materials and supplies within healthcare systems via on-demand UAS flights



#### Regional Commuter (Hybrid)

Regional air transportation of people via hybrid powered aircraft

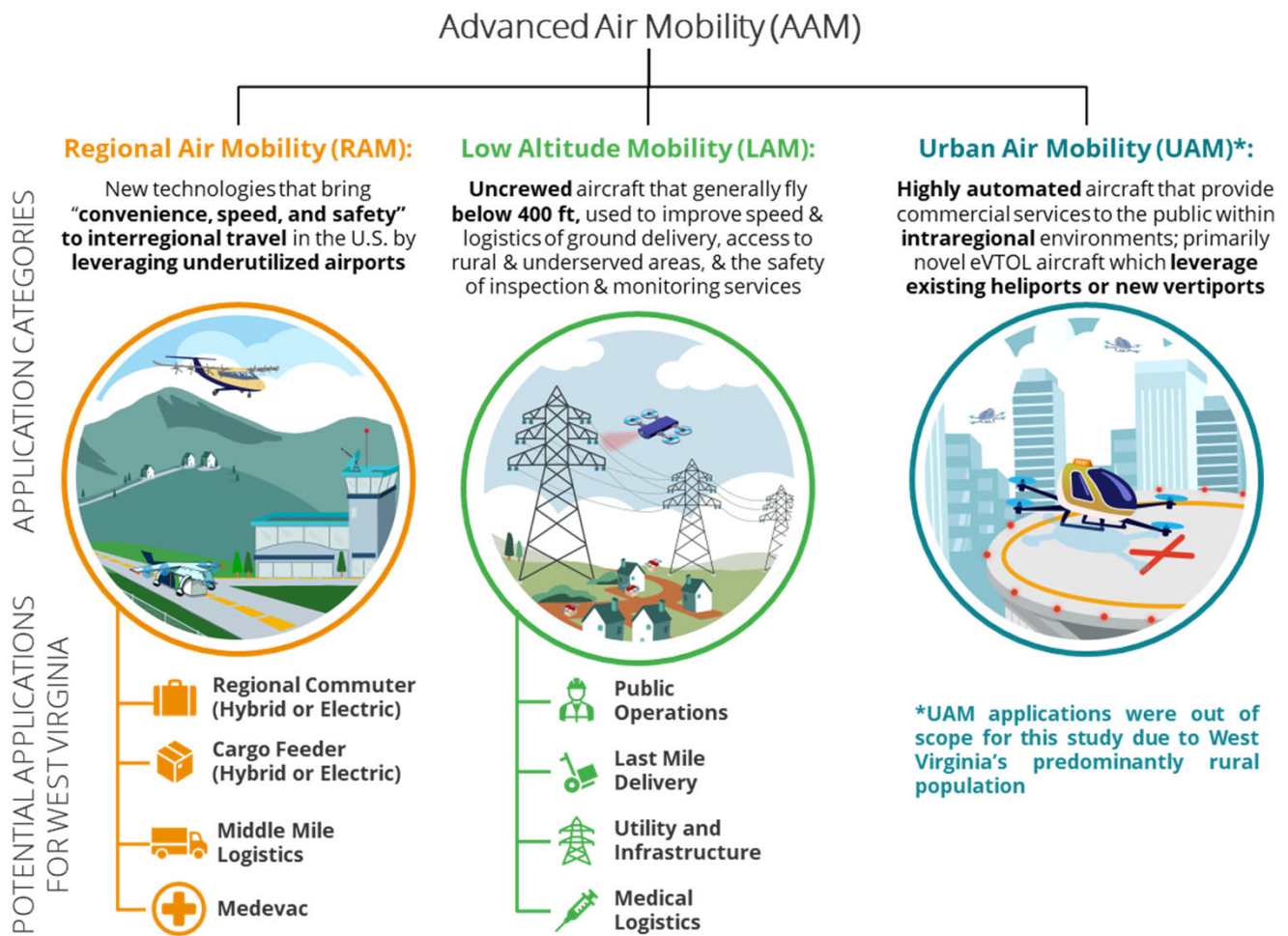
 RAM Application     LAM Application

## Initial AAM Applications for Consideration

Ten initial AAM applications emerged as relevant to West Virginia's capabilities and needs based on stakeholder interviews and West Virginia current state analysis (Note: the applications for Regional Commuting and Cargo Feeder each count as two applications based on using hybrid aircraft or electric aircraft).

The AAM applications considered all fall within the application categories of RAM and LAM (Exhibit 16) – UAM applications, given their urban operating environments, were out of scope for this assessment due to West Virginia's predominantly rural population.

**Exhibit 16: Initial AAM Applications Identified for Consideration**





## RAM Applications

RAM applications leverage new technologies and underutilized airports to enhance convenience, speed, and safety of interregional travel. Six RAM applications were considered relevant to West Virginia, as defined below (note: the applications for Regional Commuting and Cargo Feeder each count as two applications based on using hybrid aircraft or electric aircraft).

### Regional Commuting (Hybrid/Electric) -

Regional commuting flights refer to the transportation of people by air between regional hubs. Post-1978 Airline Deregulation Act, the airline industry largely adopted a hub-and-spoke model where commuter aircraft provide service to regional hubs from smaller regional airports. This shift, while expanding air travel, led to a consolidation of services focused on high-volume markets, often at the expense of rural and smaller communities due to cancelled routes.<sup>75</sup> In West Virginia, this trend has resulted in diminished air connectivity and increased costs. For instance, in Q2 of 2023, the average domestic airfare for West Virginia CRW Airport was \$578.37, compared to the national average of \$391.79.<sup>76</sup> The EAS program has attempted to address these challenges through subsidies for certain rural routes, but according to air carriers and community officials, the impact has been limited due to the reduction of eligible communities, and wage increases have not kept up with the subsidy caps.<sup>77</sup> RAM presents an opportunity to revitalize these neglected routes with novel aircraft and technologies, offering a potentially more affordable, accessible, and efficient air travel option for West Virginia's dispersed population.

### Cargo Feeder (Hybrid or Electric) -

Cargo feeder flights refer to the regional air transportation of cargo. Echoing the challenges faced in regional commuter transport, legacy air cargo carriers also struggle with maintaining service to smaller markets due to aging aircraft fleets and pilot shortages that impact feeder airlines.

These challenges have inflated operation costs and, in some cases, led to reduced services levels, particularly impacting rural customers like West Virginians. RAM, with its potential for automated and more cost-effective operations, could serve as an innovative solution to sustain and enhance cargo delivery services to these areas, providing continuous support for local economies.

### Middle Mile Logistics -

Middle mile logistics involves the transportation and movement of goods between distribution centers or hubs, connecting the initial source to the final distribution point. Middle-mile logistics is typically reliant on feeder trucks or transport vans, making their efficiency subject to traffic and road conditions. RAM operations for middle mile logistics could provide faster and more direct air connections for various logistical purposes, including inventory restocking and expedited delivery of time-sensitive goods. This pivot from ground-based logistics to RAM operations would enhance the speed and responsiveness of supply chains, particularly in areas like West Virginia where the rugged terrain limits the efficiency of ground transportation.

### Medevac: Inter-Hospital -

Inter-hospital Medevac, or medical evacuation, refers to the swift transportation of patients between hospitals. West Virginia currently relies on conventional medevac aircraft and ambulance services for patient transfers between healthcare facilities. However, there's a critical need to improve these services, as evident by the state's longer median Door-In to Door-Out times for patient transfers compared to the national average (the median time for West Virginia was 118 minutes, whereas the median time for all patients nationally was 64 minutes).<sup>78</sup> RAM, with its ability to navigate over challenging terrains swiftly, presents a promising solution to reduce patient transfer times and costs. By integrating RAM into the state's medical emergency infrastructure, West Virginia could enable quicker, more reliable patient transport, particularly vital for those in remote or hard-to-access areas.

## LAM Applications

LAM encompasses uncrewed aircraft, or UAS, that generally fly below 400 feet. LAM aircraft are used to improve speed and logistics of ground delivery, access to rural and underserved areas, and the safety of inspection and monitoring services. Four LAM applications were identified as relevant to West Virginia's capabilities and needs and are defined below.

### Public Operations -

LAM aircraft, specifically UAS, have a broad range of applications in public operations, aiding in tasks that may be considered "dull, dirty, or dangerous" to provide efficiency and safety to public servants. Examples include emergency response, where UAS can be used for search and rescue missions, assessing disaster areas, and monitoring emergency situations. UAS can also support law enforcement in response times, situational awareness, and accident reconstruction. In West Virginia, the DOT has already realized substantial cost savings and operational efficiencies through its drone program, initially used for measuring material mounds (which translated to over \$343,000 in cost savings in just one month).<sup>79</sup> This is just one example of how LAM could benefit various public sector operations.

### Last Mile Delivery -

Last mile delivery refers to the final stage of the logistics process, involving the transportation of goods from a distribution center or hub to the end consumer's doorstep or desired location. Last-mile delivery is notably the most expensive and least efficient segment within the delivery chain. The surge in e-commerce has further stressed these existing delivery networks. In West Virginia, where 36% of the population resides more than 10 miles from the nearest grocery store,<sup>80</sup> LAM for last mile delivery can modernize this segment. By deploying LAM solutions, such as UAS for package delivery, the state can enhance the efficiency and reach of last-mile deliveries, thus providing greater accessibility and convenience.

### Utility and Infrastructure -

The use of LAM aircraft, specifically UAS, for inspecting utilities and infrastructure is an emerging area with significant potential benefits. For example, rather than using expensive helicopters to fly over transmission lines to inspect them, several energy companies are turning to UAS as a cheaper, safer alternative.<sup>81</sup> Although these operations may not generate direct revenue, they can result in substantial cost-savings and reduced injury risks. In some cases, the money saved by using UAS for inspections and monitoring can be re-invested into hiring more personnel to conduct infrastructure maintenance, thereby promoting a proactive approach to supporting the resiliency and reliability of critical infrastructure.

### Medical Logistics: Inter-System -

Inter-system medical logistics refers to the rapid and efficient transportation of medical materials and supplies within healthcare systems. This transportation typically relies on courier services, which can be impacted by batch delivery bottlenecks. The introduction of LAM operations could facilitate the development of an on-demand network, increasing the speed of healthcare logistics, getting critical medical supplies and results delivered more rapidly and reliably.

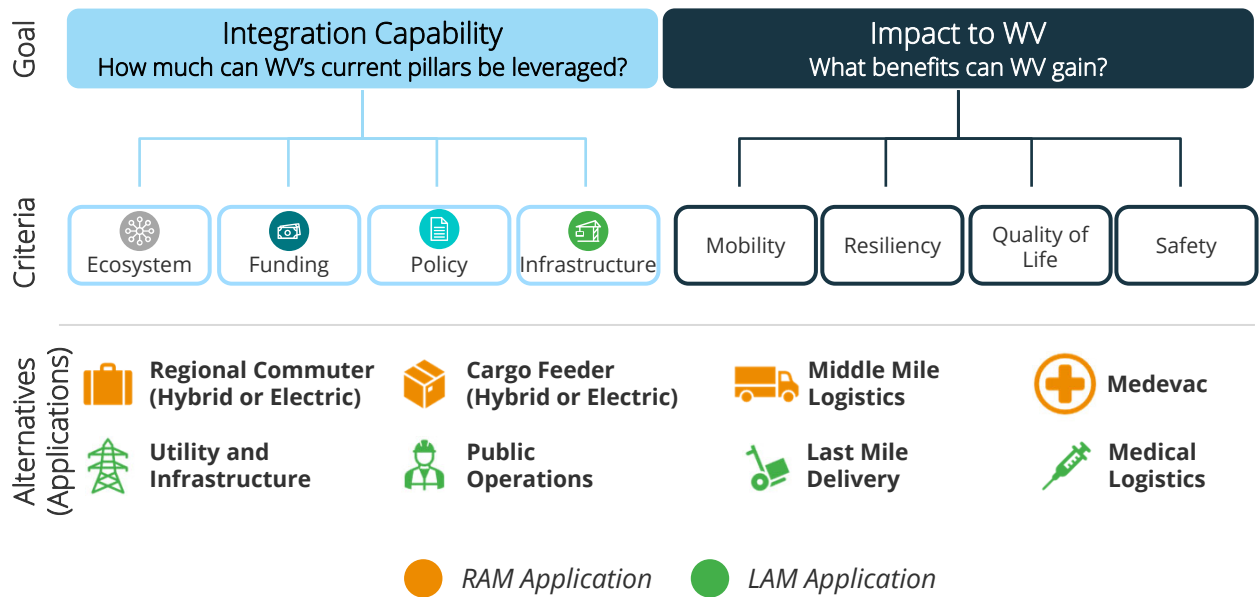
## Prioritization Criteria

The RAM and LAM Applications were compared using an Analytical Hierarchy Process (AHP), with the goals, criteria, and alternatives shown in Exhibit 17.

The first goal for each application is integration capability; how much can West Virginia’s current pillars be leveraged? Each criterion within this goal was compared and assigned weights for level of importance. Then the applications (alternatives) were measured against the criteria. Overall, applications that already had the most supporting ecosystem, funding, policies, and infrastructure in place were considered the most desirable for this goal, anticipating smoother integration with fewer challenges or barriers to entry.

The second goal for each application is impact to West Virginia; what benefits can West Virginia gain if these applications are operable in the state? Each criterion within this goal was compared and assigned weights for level of importance. Then the applications (alternatives) were measured against the criteria. Applications that offered the most mobility, resiliency, quality of life, and safety were considered the most desirable for this goal, maximizing benefits for West Virginians. Economic benefits were not considered in this step – applications deemed most desirable in this step were scoped and further assessed for their economic impact in the next section, Benefits of AAM in West Virginia.

**Exhibit 17: Criteria for Prioritizing RAM and LAM Applications in West Virginia**



## Assumptions

With the novel nature of many RAM and LAM applications, assumptions were made regarding the current methods and aircraft used for each application, the technology readiness and capabilities of the future RAM and LAM aircraft, and the regulatory environment.

The LAM and RAM applications under consideration will replace or enhance current operations. Where applicable, assumptions were made for the incumbent method and parameters used for each application to establish a baseline against which to measure RAM and LAM impact (Exhibit 18).

RAM and LAM technologies encompass a wide range of aircraft in varying phases of development and maturation, ranging from prototyping, to pursuing Airworthiness Certification, to being fully operational. Current RAM and LAM aircraft in development or operations were used to make assumptions regarding aircraft specifications including range, capacity, speed, and efficiency.

Exhibit 18 shows an example of assumptions made regarding the incumbent method and RAM/LAM method for two applications under consideration.

A robust and supportive regulatory environment is needed to make RAM and LAM operations possible; therefore, this study assumes the necessary regulations will be in place. This includes establishing clear airworthiness criteria and standards, training and certification requirements and ensuring operational rules that balance safety and efficiency. As previously highlighted, these efforts are currently underway including the rulemaking efforts for Airmen Certification and Operating Rules.

**Exhibit 18: Example Assumptions for Assessing AAM Applications**

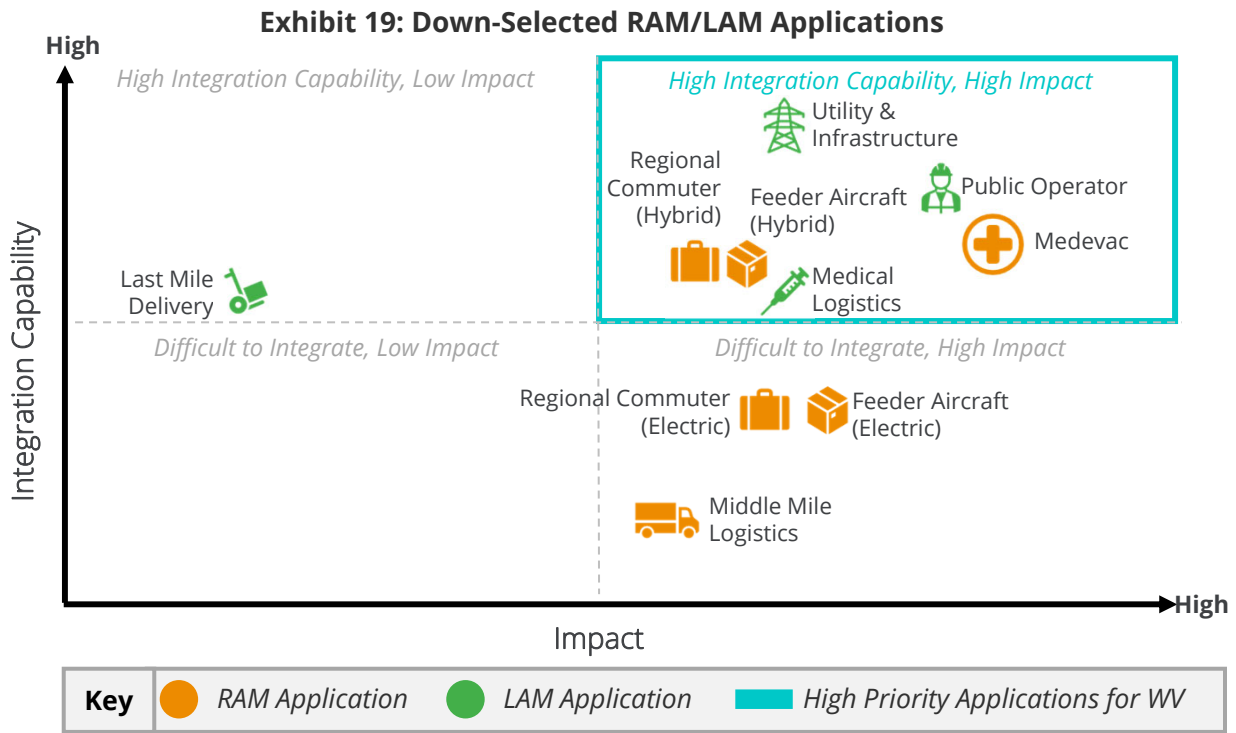
Application	Scope	Incumbent Method	RAM/LAM Method
<i>Regional Commuter</i>	Airport-to-Airport Schedule air services on routes ranging from 100 to 1,000 miles	ERJ-135 aircraft	Hybrid: Ampaire Electric: Surf/Eviation
<i>Utility and Infrastructure</i>	Inspection of physical assets or risk mitigations related to its operations	Bell 407 or Manual	Censys Technologies Sentaero

## Down-Selected RAM and LAM Applications Considered High Priority for West Virginia

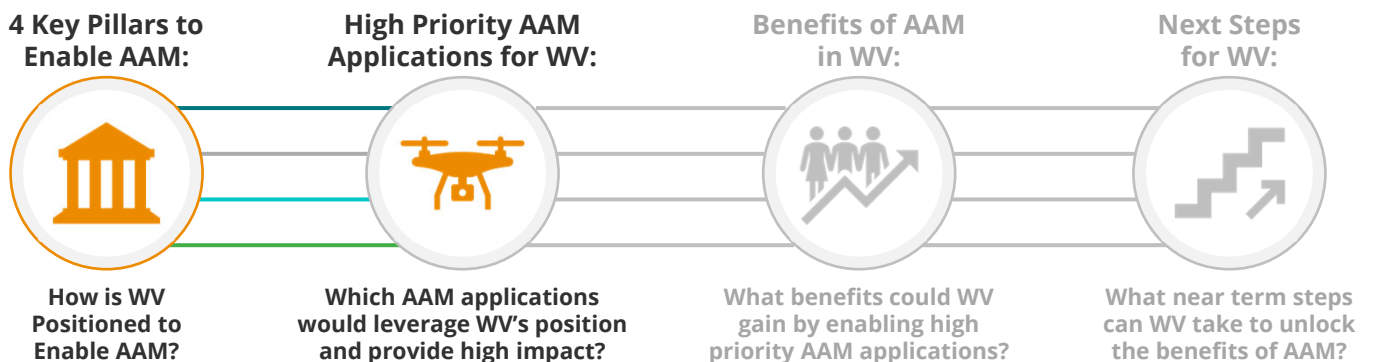
The ten initial RAM and LAM applications identified as relevant to West Virginia’s needs and capabilities were assessed using the AHP and assumptions previously explored. Applications scoring high on both impact and

integration, positioned in the graph's upper right quadrant, were deemed most desirable.

These top six applications could leverage many of West Virginia’s current assets while providing high impact to the state. (Exhibit 19)



This section prioritized AAM applications for West Virginia to strategically enable, answering the question **“Which AAM applications would best leverage West Virginia’s position and provide maximum impact to the state?”** The following section will outline the societal and economic benefits West Virginia could gain by enabling those applications to answer the question **“What benefits could West Virginia gain by enabling high priority AAM applications?”**



## Benefits of AAM in West Virginia

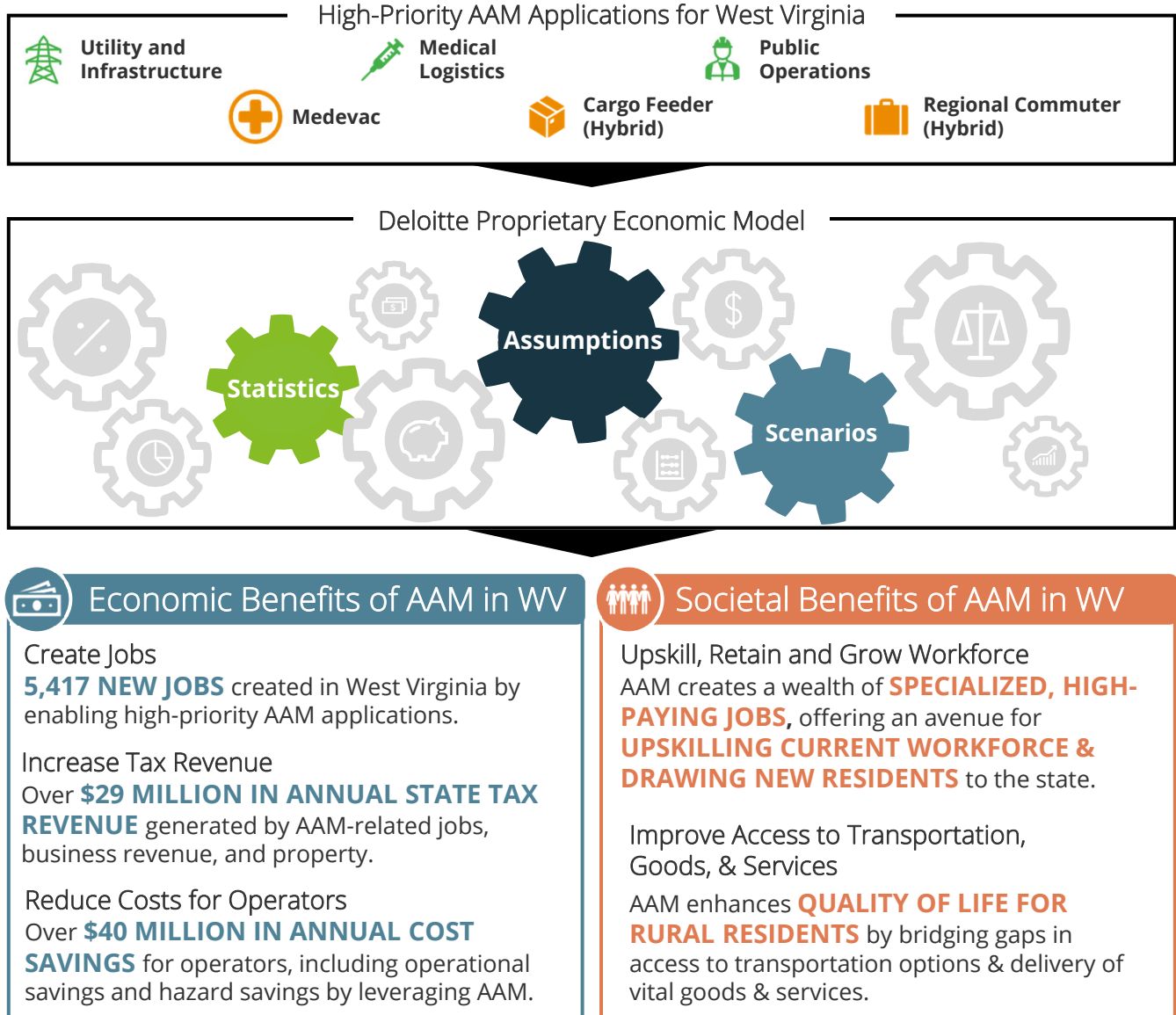
What benefits could be realized in West Virginia by enabling high priority AAM applications?

West Virginia, with its rugged terrain and strong community values, is positioned to leverage AAM applications to overcome historical transportation challenges, unlocking benefits for the economy and society. A proprietary economic model was employed to evaluate the potential economic advantages West Virginia could gain by enabling the six RAM and LAM applications considered high priority for the state (Exhibit 20).

The assessment is not time based, but rather assumes that these applications are fully integrated and operational at scale. This modeling leverages current data and statistics, FAA forecasting for AAM operations,<sup>82</sup> and conservative estimates to calculate impact.

This section details each economic and societal benefit West Virginia could gain by enabling AAM.

**Exhibit 20: Methodology for Assessing AAM Benefits in West Virginia**



## Economic Benefits of AAM in West Virginia

West Virginia could create jobs, generate tax revenue, and cut costs by enabling high priority AAM applications in the state.

### Creating Jobs

Enabling the operation of high-priority AAM applications would create direct, indirect, induced, and catalytic jobs across West Virginia (Exhibit 21). For example, consider the regional commuter application: a West Virginian booked a RAM flight. An agent checks the passenger in at the front desk and handles their luggage, then three transportation security officers screen the traveler. Concurrently, the RAM operator is coordinating with air traffic control officers to confirm departure time and airspace access. Ground crews and technicians prepare the RAM aircraft. Finally, at the boarding gate, another agent verifies the traveler's boarding passes and guides the passenger to the aircraft, where a pre-flight attendant prepares the traveler for takeoff. In this one example, over a dozen jobs directly support a single regional commuter flight. These roles exemplify the diverse direct job opportunities essential for one operation of one AAM application. In addition to direct jobs, AAM applications would

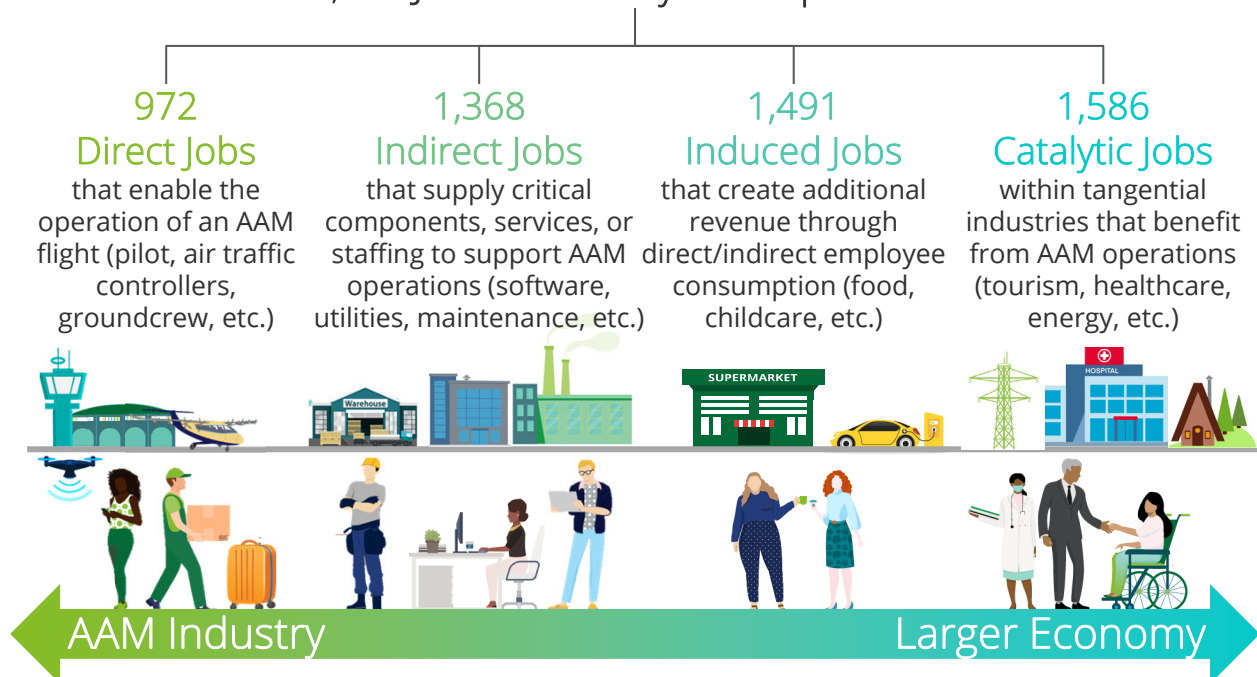
create indirect, induced, and catalytic jobs as well.

As AAM capabilities mature and operations scale, indirect jobs become pivotal in providing essential resources for workforce development. This encompasses tasks like maintaining, repairing, and operating infrastructure, essential for the industry's sustainability and economic success. The growth of the AAM industry will, in turn, boost the development of related businesses and services in the region. The spending of these employees on daily necessities, such as groceries and transportation, spurs growth in these sectors to meet the rising demand. This process, known as induced job growth, generates additional economic benefits for West Virginia.

Equally significant are the catalytic jobs that emerge alongside the industry's growth. These jobs arise in adjacent sectors like tourism, healthcare, and energy, which evolve in response to the regional economic expansion of AAM. The maturation of the AAM industry not only supports its immediate ecosystem, but also propels growth in these interconnected industries.

**Exhibit 21: Jobs created by enabling AAM in West Virginia**

5,417 Jobs Created by AAM Operations



### Generating State Tax Revenue

AAM also has the potential to significantly impact the economic landscape of West Virginia by generating \$29 million in tax revenue from property, business revenue, and income taxes. (Exhibit 22).

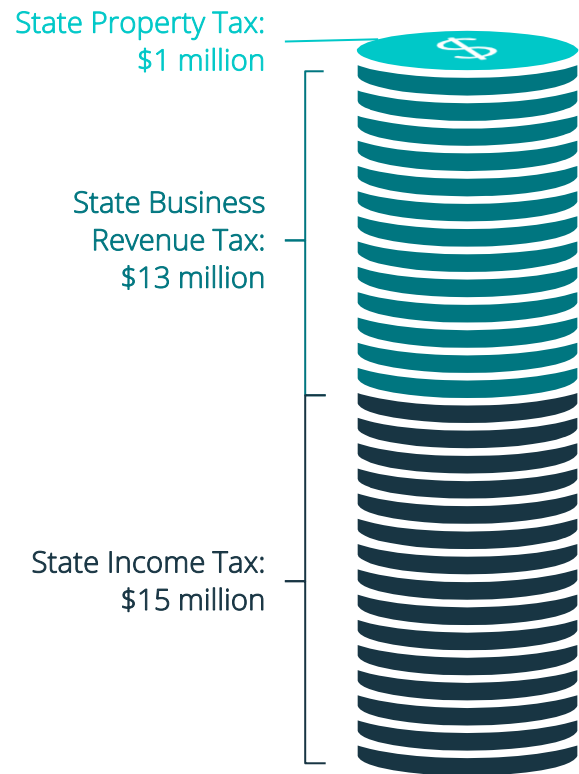
The surge of new employment opportunities created by the AAM industry will stimulate both current and new residents in West Virginia. Based on existing real estate rates, homeownership assumptions, and property values, it is anticipated that enabling AAM operations in West Virginia will generate \$1 million in annual state property tax revenue.

AAM operations will attract new industry as well as new customers for West Virginia’s current industry, contributing to \$13 million in annual state business revenue taxes for the state.

The jobs created by AAM operations – spanning direct, indirect, induced, and catalytic – will contribute to \$15 million in annual state income tax revenue for West Virginia. This estimation considers current income taxes, anticipated growth and wages, and is subject to a variety of factors including economic conditions, wage levels, and policy changes.

**Exhibit 22: Tax revenue generated by enabling AAM in West Virginia**

\$29 million in Annual State Tax Revenue





### Cutting Costs for Operators

Operators, including government departments and agencies, would realize significant operational and hazard cost savings by leveraging AAM applications for their operations as a cheaper and safer alternative. Across all six AAM applications considered high-priority for West Virginia, operators could see \$29 million in annual operational savings and \$11 million in annual hazard cost savings (Exhibit 23).

Operational cost savings by AAM includes money saved by replacing current platforms with AAM aircraft as well as money saved by reducing the number of labor hours per operation. For example, consider the public operations application: a search and rescue squad inspecting a remote area of West Virginia for missing hikers. Instead of sending a crew in a helicopter, the squad can deploy a UAS with sensors right away to search the area, successfully locating the hikers and sharing the coordinates to deploy the helicopter or ground-based personnel for rescue.

In that single operation, a relatively inexpensive UAS – remotely piloted by one person, with a second person reviewing camera feed – can replace a helicopter and a four-person crew during the search process. When compared to the helicopter, the UAS is much cheaper to purchase, power, and maintain, and requires a smaller crew to operate from the safety of the ground. This would free up resources for the squad and allow for a more efficient use of the helicopter for rescue operations.

Hazard cost savings by AAM includes money saved by reducing injuries and fatalities during

**Exhibit 23: Cost savings generated by enabling AAM in West Virginia**



operations. For example, consider the utility and infrastructure application: a crew inspects transmission lines after a storm. Instead of immediately sending a line worker up a potentially damaged transmission tower, or flying a helicopter in potentially dangerous atmospheric conditions, the crew uses a UAS with cameras and sensors to inspect the transmission lines for damage. By doing this, the crew knows where potential hazards are and pinpoints areas that need repair, reducing the risk of injuries for the crew.

Line workers and pilots are regularly listed in the top twenty-five most dangerous jobs by the Bureau of Labor Statistics in terms of fatality rate.<sup>83 84</sup> By using UAS for transmission line inspection, the crew reduces their risk of injuries and fatalities, increasing overall employee safety and reducing employer injury and fatality costs.

## Societal Benefits of AAM in West Virginia

In addition to several economic benefits, AAM has the potential to significantly impact West Virginia's workforce and quality of life.

### Workforce Upskilling and Retention

AAM's introduction in West Virginia is projected to significantly boost job creation, especially in high-tech sectors. The aviation sector is already a significant economic contributor to West Virginia's economy, with airports alone contributing more than \$1.6 billion to the state's economy and supporting more than 10,770 jobs.<sup>85</sup> AAM would further catalyze that impact, by generating new workforce opportunities through the establishment of AAM facilities and services that will require skilled personnel in scientific, technical, and engineering fields. AAM would also cause growth in supporting industries such as utilities, infrastructure development, and manufacturing. This influx of high-paying jobs is expected to contribute substantially to local economies, elevating average income levels, retaining skilled employees, and fostering economic development.

In addition to providing retention opportunities to current residents, the jobs created by AAM could attract new residents and draw former residents back to West Virginia. According to local stakeholders, many West Virginians have a deep sense of pride in their state and Appalachian culture and wish to stay in West Virginia throughout their lives. Despite this, the scarcity of job opportunities has historically compelled many to leave the state, contributing to a population decline of over 4,000 people since 2022.<sup>86</sup>

To counter this trend, innovative programs have been launched to retain the current workforce and attract new residents. For instance, through a collaborative effort between WVU, Marshall University, and state economic initiatives, recent graduates are being supported in finding rewarding careers within West Virginia.<sup>87</sup> These efforts include providing resources such as co-working spaces, mentorships, and professional development opportunities.

Another innovative program is the ASCEND Program, which offers cash and recreational incentives for remote workers to move to West Virginia. The program is application based, targeting "innovative, bright minds." ASCEND has already seen a 98% retention rate in program participants and is expected to bring over 1,000 remote workers to the state over the next six years.<sup>88</sup>

Initiatives like these are crucial as West Virginia strives to retain its educated workforce, especially in sectors poised for expansion due to AAM's growth. The numerous jobs created by AAM in West Virginia could attract former residents and new residents alike.



## Improved Access to Transportation, Goods and Services

AAM stands to transform the quality of life for West Virginians, offering improved access to transportation options, goods, and services for residents.

RAM offers a vital new mode of regional transportation for the 24% of West Virginia's rural residents that currently lack access to intercity transportation<sup>14</sup> due to challenges developing and maintaining ground-based transportation infrastructure across the state's rugged terrain. RAM would offer regional transportation options for West Virginian commuters and travelers, leveraging underutilized airports across the state and flying over the state's rugged terrain. AAM can be an equalizer to democratize the skies, by reducing the average domestic airline itinerary fare due to its lower cost for operations and opportunity to scale operations.

RAM also offers improved movement of cargo, bringing not only necessary resources to West Virginians but also providing a faster level of delivery service for a broader set of goods. A majority of the U.S. population has become accustomed to same-day and one-day delivery options for ecommerce purchases.<sup>89</sup> However, this is not the case for West Virginia, where rural and remote communities face longer delivery times for ecommerce goods and distribution issues for essential goods like food. The state has been experiencing challenges in providing fresh, healthy foods to residents – such as produce, meat and dairy - due to supply chain disruptions and closures of essential distribution centers.<sup>90</sup> This contributes to one in seven West Virginians suffering from hunger.<sup>91</sup> RAM offers efficient movement of time-sensitive cargo to rural areas by leveraging underutilized airports across West Virginia, thereby reducing travel burdens on residents and providing access to essential goods.

RAM and LAM applications, such as medevac, medical logistics, and utility/infrastructure operations offer safe and efficient access to healthcare and reliable utility services for West Virginians.

The state's rugged terrain and isolated communities pose challenges for residents to have adequate access to healthcare facilities and services, as well as challenges to the transportation of medical supplies within healthcare systems.

For instance, West Virginia ranks highest in the nation for the prevalence of heart attacks (7.5%) and coronary heart disease (8%).<sup>92</sup> A West Virginian suffering a heart attack in a rural area may be over an hour's drive from the nearest emergency room and may have to wait up to 50 minutes for an ambulance to respond. A UAS used to fly a defibrillator to the scene could serve as a first line of defense for the patient. Even if the patient had time to get to the ER, they would likely need to be transferred to a major hospital via medevac.

A RAM medevac aircraft could offer swift transportation between healthcare facilities at a faster or cheaper rate than traditional ambulances and helicopters, improving the state's sub-par door-in-door-out time.<sup>78</sup> After the patient received treatment for their heart attack, they would be sent home with several prescriptions to fill. However, the patient may live hours away from a pharmacy that can fulfill those prescriptions. A UAS used to quickly fly the medications to the patient's closest pharmacy/approved healthcare facility would lower time and distance barriers for the



patient, increasing the likelihood of the patient filling their prescription and taking their medicine. A West Virginia healthcare stakeholder expressed interest in UAS prescription delivery operations like previously described. This could be an innovative addition to the “Meds-to-Beds” program, which provides patients with their medication before leaving the hospital. In this example, RAM and LAM applications offer improved access to healthcare and improved patient outcomes, addressing critical healthcare challenges in West Virginia.

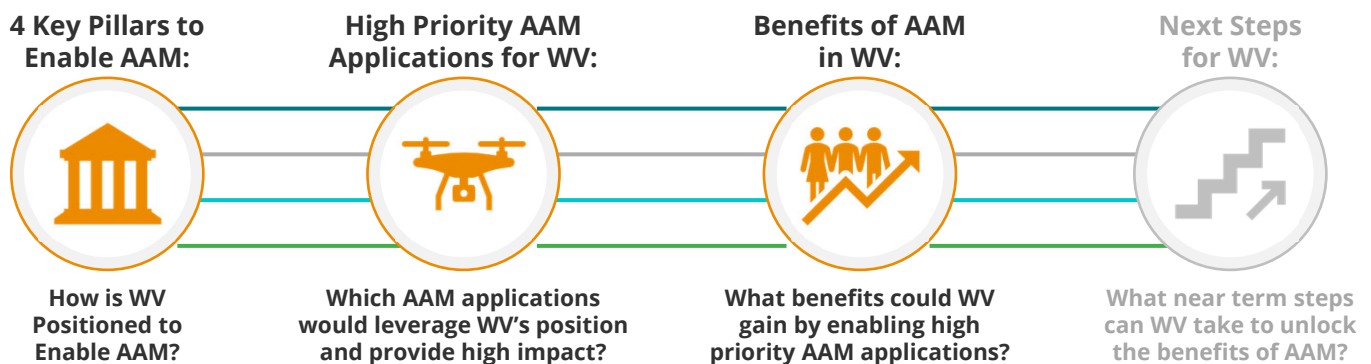
The integration of high-priority RAM and LAM applications in West Virginia not only

revolutionizes transportation options for rural residents but also serves as a catalyst for democratizing the skies, reducing travel costs, and addressing long-standing challenges in delivering essential goods to remote communities. By efficiently moving both passengers and time-sensitive cargo, these innovations contribute significantly to enhancing the overall quality of life for West Virginians, bridging gaps in healthcare access, and improving the delivery of vital goods and services. As these technologies continue to evolve, the potential for positive impacts on the state's transportation infrastructure, economy, and well-being remains promising.

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This section outlined the societal and economic benefits West Virginia could gain by enabling several AAM applications, answering the question **“What benefits could West Virginia gain by enabling high priority AAM applications?”**

The following section outlines next steps West Virginia can take to become an early adopter of AAM, to answer the **question “What near term steps can West Virginia take to unlock the benefits of AAM?”**



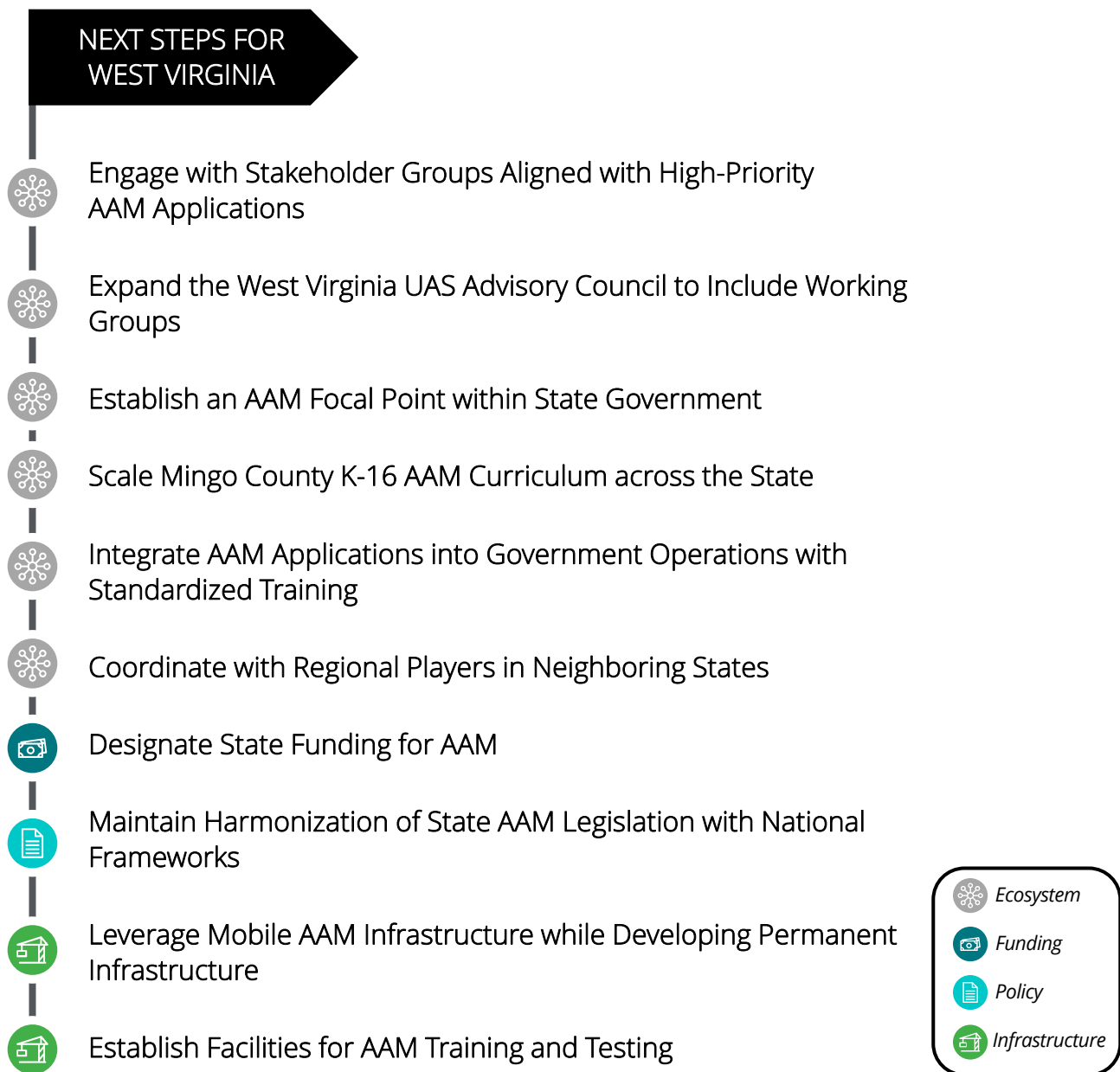
## Next Steps for West Virginia

What are near term steps West Virginia can take to unlock the benefits of AAM?

West Virginia can unlock several economic and societal benefits for the state if they strategically enable high-priority AAM applications. Below are potential next steps for West Virginia to consider to enable AAM

operations and realize the benefits they can bring. Each step is explored further in this section, highlighting a priority area that warrants dedicated, in-depth planning efforts.

**Exhibit 24: Next steps for West Virginia to enable AAM**



## Ecosystem Steps



### **Engage with Stakeholder Groups Aligned with High-Priority AAM Applications**

The RAM and LAM applications considered high priority for West Virginia touch a broad spectrum of sectors and stakeholders that should be actively engaged throughout strategy development and planning. These stakeholder groups include but are not limited to the general public/community, healthcare providers, utility providers, cargo and logistics companies, commercial aviation companies, and first responders. It is crucial to engage these groups through various methods such as forums, advisory roles, and events to ensure a comprehensive and inclusive strategy.

### **Expand the West Virginia UAS Advisory Council to Include Focused Working Groups**

AAM encompasses a wide range of technologies and applications, requiring focused and collaborative efforts by several diverse experts and stakeholders to inform priorities. The West Virginia UAS Advisory Council has nine appointed members spanning state government, academia, and industry that are responsible for a broad scope of identifying trends, developing strategies, and recommending legislation regarding UAS. Initial findings and recommendations from the UAS Advisory Council will need to be reviewed further and developed into tactical, actionable plans, requiring more personnel and focused efforts on individual topic areas. Enabling the UAS Advisory Council to convene Working Groups can drive specialized efforts on specific areas of interest or challenges, promoting a more comprehensive and detailed approach to addressing complex issues and providing valuable insights and recommendations for West Virginia.

### **Establish an AAM Focal Point within State Government**

Enabling AAM requires close coordination across state government departments and agencies. A designated, full time AAM Focal Point within West Virginia's government is needed to maximize the impact of the West Virginia UAS Advisory Council's recommendations by leading the coordination and execution of those recommendations across state government. The AAM Focal Point should be positioned within a department or authority tied to transportation, economic development, or technology innovation to coordinate and advocate for AAM regulations, funding, infrastructure development, and integration into relevant state plans and strategies. The creation of such a Focal Point would improve resource management and enhance the effectiveness of implementation efforts. Moreover, it would provide a clear direction and accountability, fostering a more efficient and responsive approach to addressing a complex intermodal integration of AAM.

### **Scale Mingo County K-16 AAM Curriculum across the State**

Developing and maintaining a skilled, resilient AAM workforce starts at the primary education level. Mingo County is developing and will pilot a K-16 AAM curriculum that incorporates learning opportunities for the design, manufacturing, flight operations, airspace management, and sustainment of AAM assets. When ready, this curriculum should be scaled across the state to promote an AAM talent pipeline and proactively prepare West Virginia's workforce for an industry projected to grow seven-fold in the coming decade.<sup>1</sup>

## **Integrate LAM Applications into Government Operations with Standardized Training**

LAM applications across public operations – such as emergency response - offer potential cost-saving and even life-saving benefits if performed with proper technique and coordination across government agencies. Training, certifying, and credentialing government personnel in the use of LAM technologies – such as UAS – would enable the safe and efficient integration of LAM applications into government operations. While there is currently no nationally established credentialing authority to provide UAS education and training for first responders, West Virginia’s ecosystem member, ASSURED Safe, is developing education materials, training courses, and standards to address this.

## **Coordinate with Regional Players in Neighboring States**

Successful development of AAM, particularly for regional travel beyond state lines (such as RAM), requires strong coordination across state governments extending beyond individual state lines. To unlock the full potential of AAM at a national level, states must not only harmonize their efforts in areas including policy, funding, and infrastructure development, but also actively collaborate to establish a regional route network across bordering states. This network could boost return on investment, by expanding the scope and scale of AAM operations.

West Virginia already collaborates across the Appalachian Region to foster economic development and innovation, making AAM a natural next step in coordination efforts and priorities. AAM coordination across state lines should be done through methods such as joining or establishing AAM coalitions, attending roundtables and events, or participating in national programs. These activities will amplify diverse perspectives, fostering a comprehensive approach for integration as well as providing a forum for an exchange of innovative ideas and best practices.

## **Funding Steps**

### **Designate State Funding for AAM**

Allocating state funding for AAM efforts signals state support and leadership in developing and fostering an AAM industry. By funding initial AAM efforts such as planning and strategy development, education initiatives, and infrastructure development, the state would be “shovel-ready” to attract industry investments and unlock the societal and economic benefits of AAM. A key next step for West Virginia is to dedicate funding for the development of a comprehensive planning document to integrate AAM within an intermodal system, while leveraging existing infrastructure. This document would serve as the pivotal blueprint, setting the stage for the identification of key additional investments to propel the state into a new era of innovation and growth.

## **Policy Steps**

### **Maintain Harmonization of State AAM Legislation with National Frameworks**

Strategic alignment with national AAM strategies, plans, and frameworks not only situates a state as a pivotal player in a harmonized and competitive national ecosystem, but also positions it as an early adopter of AAM technology. West Virginia should proactively inform its legislation by drawing on valuable and timely resources such as the FAA's Innovate28 Plan and the forthcoming AAM National Strategy from the AAM Interagency Working Group (scheduled for publication in 2024).<sup>94</sup> This approach not only demonstrates forward-thinking but also contributes to fostering seamless alignment and compatibility across state borders, aligning with the overarching national vision for the future of AAM.

## Infrastructure Steps

### Leverage Mobile AAM Infrastructure While Developing Permanent Infrastructure

Leveraging and expanding West Virginia’s unique mobile AAM infrastructure - while developing permanent AAM infrastructure – enables near-term AAM research and operations while preparing for operations at scale in the long term. The Mingo County Redevelopment Authority is in the process of procuring a low-cost, mobile airspace monitoring system for AAM airspace surveillance and communication that could cover a 2.5-mile operational radius.<sup>20</sup> Procuring and deploying multiple mobile airspace monitoring systems would support a versatile and transportable AAM test environment for research and development efforts. In parallel, developing permanent infrastructure to support state-wide C2 and DAA capabilities, backhaul networks, and a command-center would proactively prepare West Virginia for state-wide AAM operations, and an industry projected to reach \$115 billion annually in the next decade.<sup>1</sup>

### Establish Facilities for AAM Training and Testing

West Virginia’s remote areas offer the space, privacy and diverse environment conducive for AAM training and testing for government agencies, academia and private industry. The establishment of an AAM training facility, such as an ASSURED Safe Training Center, would foster research and development of AAM to meet emergency response mission requirements while also providing protocols and training for various federal, state, and local public safety agencies across the region. The establishment of an AAM proving ground for research, development, testing and evaluation of AAM technologies would attract industry and academia, fostering innovation in the region.

This section outlined next steps West Virginia can take to become an early adopter of AAM, to answer the **question “What near term steps can West Virginia take to unlock the benefits of AAM?”**

#### 4 Key Pillars to Enable AAM:



How is WV Positioned to Enable AAM?

#### High Priority AAM Applications for WV:



Which AAM applications would leverage WV’s position and provide high impact?

#### Benefits of AAM in WV:



What benefits could WV gain by enabling high priority AAM applications?

#### Next Steps for WV:



What near term steps can WV take to unlock the benefits of AAM?



# Shaping the Future of Transportation

## West Virginia's Opportunity

West Virginia is poised to become a key player in the AAM arena by leveraging its diverse ecosystem, unique assets, existing infrastructure, and demand for innovative transportation solutions. While AAM offers numerous benefits for the state, West Virginia must act swiftly to harness the rapidly emerging AAM industry. A failure to act quickly and decisively may result in a lost opportunity as other states make significant investments in AAM development and infrastructure. By taking strategic next steps, West Virginia could enable AAM operations that results in significant societal and economic impact for the state.



Vertex Partners connects small businesses, innovators, and researchers with a spectrum of other Appalachian entities and larger organizations, such as the Air Force and the Department of Defense. Vertex consolidates these disconnected entities through innovative ecosystem integration, fortifying connections, and unlocking collaborative opportunities.

While navigating the unintuitive and complex federal contracting landscape can be a challenge, Vertex's team of industry veterans lends their expertise, guiding businesses through the intricacies of the process. By connecting the dots for businesses and academia alike, Vertex Partners has developed a network of dynamic Appalachian innovators dedicated to breathing new life into the area's economic landscape.

As part of its mission to revitalize Appalachia, Vertex Partners plays a key role in positioning West Virginia at the forefront of the emerging field of Advanced Air Mobility (AAM). Recognizing AAM's economic and societal potential in West Virginia and the state's preestablished aerospace network, Vertex fosters a statewide AAM ecosystem. The inaugural meeting of the "Coalition of the Willing" in December 2021 brought together state and local leaders, marking the commencement of efforts to shape West Virginia's place in the national AAM movement. These efforts have gained momentum, and Vertex continues to make significant headway.

To further promote West Virginian AAM, Vertex engages in regional educational and political efforts. By serving as a thought leader and initiating conversations through think pieces, Vertex offers free resources to educate newcomers to the AAM landscape. Against this backdrop, the state took a crucial step forward when Vertex petitioned the West Virginia State Legislature to create the WV UAS Advisory Council, essential to legitimizing AAM's presence in the region. Vertex President and Founder Sean Frisbee's seat on the Council further underscores the company's commitment to shaping the future of AAM in West Virginia.

Vertex's latest AAM efforts saw the company play a pivotal role in helping the Mingo County Redevelopment Authority (MCRA) secure \$2.9 million in Congressionally Directed Spending (CDS). The MCRA's K-16 UAS education initiative, cited in the study for its potential to bring quality AAM education to students throughout the state, is funded through the earmarked CDS that Vertex helped secure. This study is another steppingstone in bringing AAM to West Virginia and reinvigorate Appalachia, an effort that Vertex Partners will see to fruition.

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